December 1957

VOL. 69, No. 4 PAGES 289-390

The Wilson Bulletin

Published by

The Wilson Ornithological Society

at

Lawrence, Kansas

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Founded December 3, 1888

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THE WILSON BULLETIN

The official organ of The Wilson Ornithological Society, published quarterly, in March, June, September, and December, at Lawrence, Kansas. The subscription price, both in the United States and elsewhere, is $3.00 per year, effective in 1957. Single copies, 75 cents. Subscriptions, changes of address and claims for undelivered copies should be sent to the Treasurer. Most back issues of the *Bulletin* are available (at 50 cents each for 1950 and earlier years, 75 cents each for 1951 and subsequent years) and may be ordered from the Treasurer.

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Entered as second class matter at Lawrence, Kansas. Additional entry at Ann Arbor, Mich.

THE WILSON BULLETIN

A QUARTERLY MAGAZINE OF ORNITHOLOGY

Published by The Wilson Ornithological Society

Vol. 69, No. 4 | DECEMBER 1957 | Pages 289–390

CONTENTS

MANDARIN DUCKS, Photograph by *S. Dillon Ripley* ..... facing page 291

A SEROLOGICAL ANALYSIS OF SOME ANATID CLASSIFICATIONS ..... *William B. Cotter, Jr.* 291

FIELD NOTES ON SOME CUBAN BIRDS ..... *Charles Vaurie* 301

THE CONTRIBUTIONS OF JOSSELYN VAN TYNE TO THE WILSON ORNITHOLOGICAL SOCIETY ..... *A. W. Schorger* 314

POPULATION DENSITY OF ALDER FLYCATCHERS AND COMMON GOLDFINCHES IN *Crataegus* HABITATS OF SOUTHEASTERN MICHIGAN ..... *Andrew J. Berger* 317

A STUDY OF SUMMER BIRD POPULATIONS NEAR TOKYO, JAPAN ..... *H. Elliott McClure* 323

NOTES ON REPRODUCTIVE ACTIVITIES OF ROBINS IN IOWA AND ILLINOIS ..... *W. D. Klimstra and W. O. Stieglitz* 333

DISTRIBUTION OF THE PALM WARBLER AND ITS STATUS IN MICHIGAN ..... *Lawrence H. Walkinshaw and Mark A. Wolf* 338

FALL MIGRATION AND WEATHER, WITH SPECIAL REFERENCE TO HARRIS' SPARROW ..... *O. A. Stevens* 352

GENERAL NOTES

EASTERN PHOEBE NESTING IN LOUISIANA ..... *Horace H. Jeter* 360

COMMENTS ON WING-FLASHING AND ITS OCCURRENCE IN MIMIDAE WITH UNIFORMLY COLORED WINGS ..... *Lovie M. Whitaker* 361

BROOD CAPTURE INVOLVING CONFLICT BETWEEN TWO FEMALE MALLARDS ..... *Stuart S. Peters* 363

OBSERVATIONS ON MEXICAN BIRDS ..... *L. Irby Davis* 364

NOTES ON THE RED CROSSBILL IN MINNESOTA ..... *Robert W. Dickerman* 367

THE LOOK-OUT PERCH AS A FACTOR IN PREDATION BY CROWS ..... *F. W. Preston* 368

BROAD-WINGED HAWK IN COAHUILA ..... *Robert L. Packard* 370

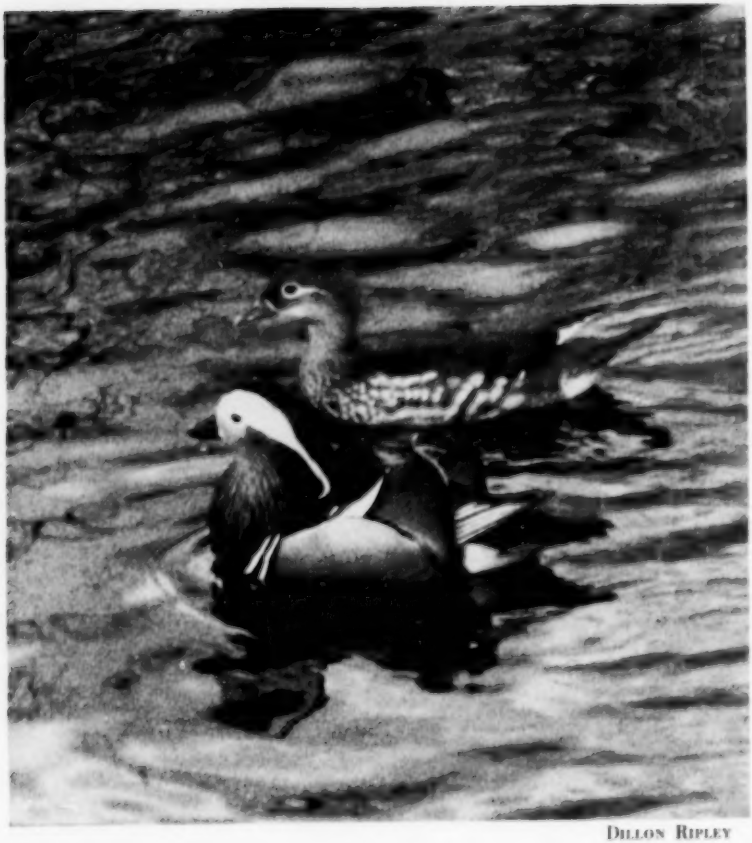
A PALLID-EYED INDIVIDUAL OF *DUMETELLA CAROLINENSIS* ..... *Alice D. Miller* 371

WILSON ORNITHOLOGICAL SOCIETY NEWS 372

ORNITHOLOGICAL LITERATURE 374

Joe T. Marshall, Jr., *Birds of Pine-oak Woodland in Southern Arizona and Adjacent Mexico*, reviewed by Wesley E. Lanyon.

INDEX TO VOLUME *69*, 1957 376



DILLON RIPLEY

MANDARIN DUCKS AT LITCHFIELD

A SEROLOGICAL ANALYSIS OF SOME ANATID CLASSIFICATIONS

BY WILLIAM B. COTTER, JR.

THE recent classification of the ducks by Delacour and Mayr (1945) is in some respects in conflict with the older systems of Phillips (1922–1926) and of Peters (1931). Delacour and Mayr instituted, on the basis of ecological preferences, behavior, and the plumage of the downy young, a new tribe, Cairinini (the Perching Ducks), for the Spur-winged Goose (*Plectropterus gambiensis*), Muscovy (*Cairina moschata*), Wood (*Aix sponsa*) and Mandarin (*A. galericulata*) ducks, among others. The older classifications had associated the Wood and the Mandarin ducks with the river ducks of the genus *Anas*. The genus *Aix* had been relegated to that position in the revisions of Salvadori's subfamily Plectropterinae (1895) by Phillips and Peters. In addition, Peters removed the Muscovy Duck from the same subfamily and placed it within the Anatinae, diametrically opposed to the position of the Wood and Mandarin ducks. Between the genera *Cairina* and *Aix* in Peters' Checklist, 13 genera were interposed, including the type genus *Anas*.

The close relationship of *Cairina moschata* and *Aix sponsa*, as repostulated by Delacour and Mayr, was supported by Yamashina (1952), who compared the shape, number, and relative lengths of the anatid macrochromosomes in gametogenesis. *Cairina moschata* and *Aix sponsa* in all features resembled one another more closely than either resembled any other of the river ducks. However, because of similarity in shape and number of chromosomes, these two genera were retained in the supergenus *Anas* as a closely related group. A divergence in the number of macrochromosomes in the Mandarin Duck, with the associated changes in relative lengths and shape, caused Yamashina to isolate this duck in the monotypic supergenus *Dendronessa*. The supergenus is a taxonomic category roughly equivalent to the tribe. This action was contrary to the grouping of the Wood and the Mandarin ducks in the single genus *Aix* as done by Delacour and Mayr and other workers.

These conflicts concerning the validity of the Muscovy–Wood Duck complex, of the relationships *inter se* and also with the tribe Anatini have been resolved by the present study. A serological analysis was proposed to validate the most natural classification of the ducks, and incorporated in the methods were four major innovations in the field of systematic serology. As antigens, three separate protein systems (ovalbumin of the egg, serum albumin and serum gamma globulin of the blood) were analyzed to correct *inter se* for variation in any one system. Secondly, each protein used had been purified to provide a single chemically-defined antigen, instead of the usual moiety of antigens used in other investigations. Thirdly, the precipitated antigen–

antibody complexes were graded directly on the basis of the precipitated protein, and the per cent relatedness expressed as a fraction of the homologous cross-reaction's precipitate. Lastly, the usual method of cross-reaction estimation was supplemented by absorption titrations to determine the amounts of antigens shared in common by any two birds.

Acknowledgments

This study was submitted in partial fulfillment of the requirements for the degree of Doctor of Philosophy in the Graduate School of Yale University. I am particularly indebted to Dr. S. Dillon Ripley and Prof. G. E. Hutchinson for their generous advice and criticism throughout this work, and for their critical reading of this manuscript in preparation. My deep thanks go also to Dr. J. S. Nicholas as director of the Osborn Zoological Laboratory where this study was approved and supported.

I wish to thank also the trustees of the Frank M. Chapman Memorial Fund of the American Museum of Natural History for the research grant which served to support a summer segment of this project.

I am grateful to those people who aided in the procurement of whole eggs and blood samples used in this study: S. Bradford, Mrs. Edgar Cartmell, S. Downes, A. Fleischner, L. Glaser, Mrs. R. W. Hanson, J. Kirakoff, V. Loosanoff, and S. Dillon Ripley. Dr. Ellsworth Dougherty of the Duck Disease Laboratory at Eastport, New York, graciously donated five gallons of Pekin Duck blood which was used to perfect the methods of serum protein separation.

Materials and Methods

The proteins that constituted the central material of this investigation were obtained from whole eggs and blood samples taken from six anatid representatives: *Anser anser* (Embden and Toulouse varieties of the Common Goose), *Anas platyrhynchos* (Mallard), *A. platyrhynchos* (domestic Pekin), *Aix sponsa* (Wood Duck), *A. galericulata* (Mandarin Duck), *Cairina moschata* (Muscovy).

The ovalbumin protein of the egg-white was prepared in crystalline form by the method of Kekwith and Cannan (1936); to reduce amounts of contaminating proteins, the ovalbumins were redissolved and recrystallized four times. Ovalbumins prepared by this method have been demonstrated by Heidelberger and Kendall (1935) to behave as single antigens in their reactions with rabbit antisera.

Crystalline serum albumin was prepared and recrystallized four times by the method of Adair and Robinson (1930), with the sole modification of substitution of sodium sulfate for ammonium sulfate as the salting agent. The serum gamma globulins were removed from the globulins first salted out from the serum, and then purified by Kendall's (1937) technique. This latter protein was not crystallized, but after proper purification was maintained in aqueous solution at 0°C. for two weeks, after which it was prepared anew from fresh serum. This precaution helped to reduce experimental error due to the use of auto-denatured proteins.

Standard 0.1 per cent protein solutions were prepared, checked with micro-Kjeldahl nitrogen determinations, used for antibody formation, and later for the titrations of those antisera in the cross-reactions and in the absorption tests. When inciting the production of antibodies, the rabbits were injected with these standardized solutions in the following manner:

First week	First day	5 cc. intravenous
	Second day	1 cc. subcutaneous
	Third day	1 cc. subcutaneous
Second week	First day	3 cc. intraperitoneal
	Second day	1 cc. subcutaneous
	Third day	1 cc. subcutaneous
Third week	First day	3 cc. intraperitoneal
	Second day	1 cc. subcutaneous
	Third day	1 cc. subcutaneous

The rabbits were then bled on the first day of the fourth week, and after separation of the serum from the clot, the antibody-containing antiserum was sterile-filtered and stored at 0°C. until used.

Relationships between these anatid species were determined first by the extent of cross-reactions of the anti-protein antisera in the presence of the homologous and the heterologous antigen solutions. This was effected by the addition of 0.1 cc. of the specific anti-protein antiserum to 0.5 cc. of that antigen solution, the latter in serial dilution from 1:1000 to 1:1024000. The reaction volume was adjusted then to 1.0 cc. with the addition of 0.4 cc. of 0.9 per cent saline; the test antigen–antibody solutions then were incubated at 4°C. for 24 hours, and at the end of that time, the precipitated antigen–antibody complexes were graded. The grading was performed visually, with six grades: 0, ±, +, ++, +++, ++++. These grades represent actual reaction levels, since they were checked frequently with micro-Kjeldahl nitrogen determinations on the precipitated antigen–antibody proteins after washing; the range values for these respective grades overlapped very little.

Grades	*Limits*	*Repetitions*	*Average*
±	0.002–0.030 mgm. N	69	0.016
+	0.030–0.070	77	0.049
++	0.066–0.116	91	0.092
+++	0.110–0.160	49	0.138
++++	0.156–0.304	37	0.236

The reaction values so determined were plotted with respect to antigen dilution. The areas under the heterologous reaction curves were expressed as a per cent relative to the area subtended by the homologous reaction curve. In the first three tables, the results of the cross-reactions of each antiserum with the heterologous and homologous antigens are given. In order, they represent the crystalline ovalbumin, the crystalline serum albumin and the serum gamma globulin systems.

To determine more precisely the common stocks of antigens, the specific anti-protein antisera were treated with the heterologous proteins individually to remove all antibodies reactant with the absorbing protein.

To 3.0 cc. of antiserum in a 15 cc. centrifuge tube was added 3.0 cc. of undiluted stock antigen solution (1:1000) and the mixture was incubated at 4°C. for 24 hours. After centrifugation, the supernatant serum was poured off into a sterile container, and

the pellet of precipitated antigen–antibody complex was discarded. This volume of 1:1 diluted antiserum was sufficient to use for simultaneous experiments with the homologous and the five heterologous proteins.

The residual antibodies of the diluted antiserum could react then with the homologous protein when added; the extent of the reaction (total amount of precipitate formed) was taken as an inverse measure of antigenic similarity of the protein pair (the absorbing protein and the titrating protein) being examined. If the homologous titration after absorption were high, few antibodies had been removed and hence there was very little similarity in the antigenic groups of the two proteins. Conversely, if the homologous titration following absorption produced only a slight precipitate, there was a high degree of antigen similarity denoted.

Tables 4 to 7 present the results of the anti-ovalbumin antisera after absorption by four of the five heterologous proteins, the data from the Mallard ovalbumin absorption experiments being omitted because of the extreme similarity to the protein absorption results for the Pekin. In each of these series, the homologous ovalbumin absorption with titrations provided experimental controls, as well as controls to indicate the complete nature of the absorption by each heterologous antigen.

Results and Discussion

In Table 1, the results are given from the reactions of the antisera prepared with the crystalline ovalbumins, when titrated with the homologous and the heterologous ovalbumin solutions. The precipitations by the anti-Embden Goose antisera gave similar results for the Pekin and the Mallard ducks (87 per cent, 81 per cent), and for the Wood and the Mandarin ducks (79 per cent, 79 per cent) also. Ovalbumins of the latter species pair reacted less strongly than the former species set, but each member of the set with an equivalent amount of antibodies. The position of the value for the Muscovy precipitation was intermediate, between those values for the *Anas* group, and for the Wood and the Mandarin ducks.

Antisera against the Pekin and the Mallard ovalbumins gave complementary values when titrated with the other's antigen; these results were utilized to determine the extent of variation within a single species, since the Pekin and the Mallard ducks are both members of the species *Anas platyrhynchos*.

Table 1

Cross-Reactions of Crystalline Ovalbumins and the Anti-Ovalbumin Antisera

Antisera	Titrating Antigens					
	Embden	Pekin	Mallard	Wood	Mandarin	Muscovy
a-Embden	100	87	81	79	79	85
a-Pekin	80	100	89	67	66	69
a-Mallard	87	94	100	81	81	99
a-Wood	75	87	87	100	88	94
a-Mandarin	57	62	64	97	100	93
a-Muscovy	54	70	77	98	91	100

In the anti-Pekin and anti-Mallard antisera the values determined for the precipitation of the Wood and Mandarin ovalbumins were almost identical (67 per cent, 66 per cent; 81 per cent, 81 per cent). As with the anti-Embden Goose antisera, the Muscovy protein gave a value intermediate between the homologous and the Wood–Mandarin set of values.

Similarly, the reaction of the Muscovy ovalbumin with the antisera against the ovalbumins of the Wood and the Mandarin ducks showed an intermediate position between the Wood–Mandarin set of values and those of the Pekin–Mallard set. The complementary cross-reactions of the Wood and the Mandarin ducks demonstrated, as did the complementary titrations of the Pekin–Mallard set, an equal amount of serological divergence. When these antisera were titrated with the Pekin and Mallard ovalbumins, the reaction values were almost identical (87 per cent, 87 per cent; 62 per cent, 64 per cent) for these antigens, and greater in extent than those for the goose antigen (75 per cent, 57 per cent).

The antisera produced with the Muscovy ovalbumin yielded the greatest heterologous response with the Wood (98 per cent) and the Mandarin (91 per cent) ducks, appreciably less with the Pekin (70 per cent) and the Mallard (77 per cent), and least with the ovalbumin antigen of the goose (54 per cent).

On the basis of these data, it would be justified to represent the linear order of relationship as follows:

Embden Goose (*Anser anser*)	Pekin–Mallard (*Anas platyrhynchos*)	Muscovy (*Cairina moschata*)	Wood–Mandarin (*Aix sponsa–A. galericulata*)

In Table 2, the values are given for the cross-reactions of the serum albumin proteins with those antisera formed against the serum albumins of the Toulouse Goose, the Pekin, the Mallard and the Muscovy ducks. Here, the heterologous cross-reaction values for the anti-Toulouse antisera indicated a greater degree of divergence in the component parts of the serum albumin

TABLE 2

CROSS-REACTIONS OF THE CRYSTALLINE SERUM ALBUMINS AND THE ANTI-SERUM ALBUMIN ANTISERA

Antisera	Titrating Antigens					
	Toulouse	Pekin	Mallard	Wood	Mandarin	Muscovy
a-Toulouse	100	57	36	36	36	27
a-Pekin	48	100	81	53	55	57
a-Mallard	46	86	100	70	46	63
a-Muscovy	49	59	53	84	86	100

antigen complex than was indicated for the ovalbumin antigen in Table 1. This was true for all of the subsequent reactions in this table, the average heterologous reaction being smaller than that in the anti-ovalbumin system.

Use of the Toulouse Goose serum proteins, and the summation of those results with those from the Embden Goose ovalbumin can be defended by the data of these experiments. The goose, *Anser anser*, has been incorporated in this analysis as a reference point, far removed from the Cairinini and the Anatini. In addition, it has been determined that subspecific differences in heterologous cross-reactions tend to diminish or vanish as the taxonomic source of the inciting antigens for the testing antisera becomes more remote. Since in all non-goose antisera, the source of the inciting antigens was sufficiently distant, the author felt justified in the assumption of virtual identity in serum proteins for the two domestic strains of *Anser anser*. However, this holds only in those tests made with an antiserum developed against a bird of distant origin.

The serum albumins of the Pekin and the Mallard ducks still reacted as closely related sets of antigens with all antisera. The Wood and the Mandarin serum albumins behaved similarly. In addition, the Muscovy protein, in two reactions out of three with different types of heterologous antisera, gave an intermediate value between those of the Pekin–Mallard set and the Wood–Mandarin set. The data derived from these tests do support the postulated order of relatedness.

The cross-reaction values of the serum gamma globulins and the respective antisera are given in Table 3. These results showed a further confirmation for the high degree of similarity in protein structure of the two forms of *Anas platyrhynchos*. With the anti-Pekin antisera, the Mallard serum gamma globulin gave the greatest heterologous response; with the anti-Muscovy antisera, the values derived from the heterologous titrations by the Pekin and Mallard proteins were identical.

The amounts of precipitates yielded by the heterologous proteins of the Wood and the Mandarin ducks repeated, for the third time, the pattern of two distinct forms with an apparent underlying similarity in antigenic structure. The serum gamma globulin of the Muscovy duck gave evidence of closest association with the Wood–Mandarin set, both in the homologous and in the heterologous antisera tests. However, its position relative to the genera *Anas* and *Aix* was given by only one heterologous antiserum type; these results did corroborate the earlier findings of the anti-ovalbumin and the anti-serum albumin antisera.

The following set of tables (4–7) for the reactions of the anti-ovalbumin antisera allowed confirmation in part of the relationship order as postulated on the basis of the first three data sets. Each anti-ovalbumin antiserum was treated with a heterologous antigen to remove all antibodies common to the

TABLE 3

CROSS-REACTIONS OF PURIFIED SERUM GAMMA GLOBULINS AND THE ANTI-SERUM GAMMA GLOBULIN ANTISERA

Antisera	Titrating Antigens					
	Toulouse	Pekin	Mallard	Wood	Mandarin	Muscovy
a-Pekin	42	100	96	44	45	49
a-Muscovy	29	54	54	80	79	100

inciting and the absorbing antigens. The residual antibodies, detected by a homologous titration following this procedure, were used as an inverse measure of the degree of divergence that the protein-synthesizing systems had undergone.

In the Table 4, the titration with the homologous Pekin ovalbumin after absorption with each antigen showed that there was no reaction with the Pekin-absorbed antisera—a control, indicating complete removal of all antibodies. The minimal positive value (21 per cent) was given by those sera absorbed by the Mallard ovalbumin, which was able to remove most of the antibodies, but not all. The Wood and the Mandarin proteins were less efficient absorbers, and the Muscovy-absorbed antisera contained the greatest amount of residual antibodies.

Hence, the order of relationship is repostulated as:

Anser *Anas* *Aix* *Cairina*

following from this set of data. With all absorbing antigens, the Pekin and Mallard set of ovalbumins reacted in equal amounts. Similarly, it was true also for the reactions of the Wood and the Mandarin ducks, when their oval-

TABLE 4

ANTI-PEKIN DUCK OVALBUMIN ANTISERA ABSORBED WITH ALL OVALBUMIN ANTIGENS AND TITRATED WITH ALL ANTIGENS[1]

Antigens Titrating	Cross Reactions	Absorbing Antigens					
		Embden	Pekin	Mallard	Wood	Mandarin	Muscovy
Embden	80	0–1	0	12	16	36	41
Pekin	100	25	0	21	40	46	58
Mallard	89	23	0	0–1	35	44	53
Wood	67	10	0	6	0	9	29
Mandarin	66	7	0	6	8	0	28
Muscovy	69	8	0	5	6	8	0

[1]In this table, the antisera are those made against the Pekin ovalbumin. The values for the cross-reactions are given on the extreme left; each column to the right gives the reaction value for that antiserum after absorption by the antigen at the top of the column, with the titrating antigen on the left side.

TABLE 5

ANTI-WOOD DUCK OVALBUMIN ANTISERA ABSORBED WITH ALL OVALBUMIN ANTIGENS AND TITRATED WITH ALL ANTIGENS

Antigens Titrating	Cross Reactions	Absorbing Antigens					
		Embden	Pekin	Mallard	Wood	Mandarin	Muscovy
Embden	75	0	1	1	0	0	0
Pekin	87	1	0	0	0	0	4
Mallard	87	7	1	0	0	0	7
Wood	100	34	34	39	0	9	23
Mandarin	88	26	21	26	0	0	15
Muscovy	94	15	9	17	0	0	0

bumins were used as the titrating antigens.

A further elaboration of the fundamental similarity of Wood and Mandarin ducks in their ovalbumin antigen complexes is found in Tables 5 and 6, where the reactions of the absorbed antisera for these ovalbumins are presented. When the complementary absorptions were made (that is, anti-Wood Duck antisera absorbed with Mandarin ovalbumin, and anti-Mandarin antisera absorbed with Wood Duck ovalbumin), the only antibodies remaining in solution were those specific for the inciting antigen, and in all other titrations no heterologous antigen reactions were observed. Similarly, after absorption by the other heterologous ovalbumins, the Wood Duck and Mandarin ovalbumin titrations followed identically with a slight increment for the homologous always found. This had been noted in the reactions of the Pekin–Mallard set of anti-ovalbumin antisera.

The position of the Muscovy ovalbumin as representative of the species showed that, in respect to the total sum of different antigens, this duck was the farthest from the *Anas* type. Its ovalbumin possessed the least share of common antigens with *Anas*, but formed a close-knit complex with the Wood

TABLE 6

ANTI-MANDARIN DUCK OVALBUMIN ANTISERA ABSORBED WITH ALL OVALBUMIN ANTIGENS AND TITRATED WITH ALL ANTIGENS

Antigens Titrating	Cross Reactions	Absorbing Antigens					
		Embden	Pekin	Mallard	Wood	Mandarin	Muscovy
Embden	57	0	11	14	0	0	0–1
Pekin	62	14	0	0–1	0	0	4
Mallard	64	16	0–1	0	0	0	4
Wood	97	29	30	29	0	0	16
Mandarin	100	37	39	39	13	0	33
Muscovy	93	24	26	25	0	0	0

TABLE 7

ANTI-MUSCOVY DUCK OVALBUMIN ANTISERA ABSORBED WITH ALL OVALBUMIN ANTIGENS AND TITRATED WITH ALL ANTIGENS

Antigens Titrating	Cross Reactions	Absorbing Antigens					
		Embden	Pekin	Mallard	Wood	Mandarin	Muscovy
Embden	54	0	13	14	17	20	0
Pekin	70	34	0	3	18	31	0
Mallard	77	41	8	0	24	28	0
Wood	98	55	29	35	1	20	0
Mandarin	91	59	25	29	7	1	0
Muscovy	100	75	47	60	61	53	0

and the Mandarin ducks. This was not only true in its cross-reactions, but also in the step-wise reductions shown by each of the three species of Cairinini as the different absorbing antigens were used (*cf.* Tables 5 to 7). With the anti-serum albumin and the anti-serum gamma globulin antisera after absorption, the same order of relationship was found.

In the cross-reactions of all three protein types, the antigens of the Muscovy Duck appeared to be intermediate in reaction extent between those of *Anas* and *Aix*. However, the absorption titrations clearly demonstrated that the antigenic complex of *Cairina* was qualitatively more differentiated from that of the *Anas* group, than were the antigen complexes of *Aix* when compared to *Anas*. The findings of the absorption tests inferred that a greater number of bio-synthetic changes had occurred within the phyletic line of the Muscovy Duck, and that the usual cross-reaction techniques were not sufficiently sensitive to demonstrate these changes. In addition, the data revealed a relationship between *Aix* and *Cairina*, not so close as within the subspecific set of the Pekin and the Mallard ducks, or as within the species set of the Wood Duck and the Mandarin, but closer than that relationship of *Anas* and *Cairina* or *Anas* and *Aix*.

Hence, the validity of the original concept of the perching ducks as a natural taxonomic category, as presented by Salvadori and modified by Delacour and Mayr, has been strengthened by these findings from the application of serological techniques. Those revisions by Phillips, Peters, and Yamashina do not reflect the most natural placement of the ducks within the limits of the Cairinini. The latter classifications of the Anatidae showed, with particular reference to the perching ducks, the use of nonobjective criteria or undue reliance on a single taxonomic feature.

SUMMARY

Analysis of recent classifications of the ducks by refined serological techniques has validated the conclusions of Delacour and Mayr, in their uniting

the genera *Cairina* and *Aix* in the single tribe Cairinini. To better the existing standard serological techniques, three separate protein systems were studied through the cross-reactions of the purified crystalline proteins with the testing antisera. Comparison of the final data derived from each set of experiments with those of the other sets served to reduce error possibly resulting from chance variations in single systems. As a check upon the cross-reaction as a true measure of species relatedness, absorption of the antisera by different heterologous antigens in the same protein species, followed by homologous titration, gave a measure of the common stocks of antigens shared. In certain cases, notably those of the Muscovy Duck proteins, the cross-reaction values indicated a much closer relationship than existed on the basis of common antigen stocks. Hence, the sole use of cross-reaction data requires that caution be exercised in their interpretation.

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FIELD NOTES ON SOME CUBAN BIRDS

BY CHARLES VAURIE

DURING the summer of 1956, Mrs. Vaurie and I passed the month of July in Cuba collecting insects, and I took this opportunity to observe birds as much as possible. The western part of the Province of Pinar del Rio was visited for about two weeks, including a stay of three days (July 3 to 5) on the Peninsula de Guanahacabibes at the extreme western tip of the Island. The rest of our time, except for about three days in Havana, was spent in the southern part of Las Villas Province.

The Peninsula is most inaccessible and seldom visited other than by lumbermen. Space may be taken to describe its features briefly as it represents one of the very few remaining regions of Cuba that are relatively undisturbed.

The Peninsula is a limestone table with a mean elevation of about 40 feet, and is connected to the rest of the island by a sandy savanna. The Peninsula itself is covered by a very dense hardwood forest, a brief survey of which is given by Smith (1954) in his paper on the forests of Cuba. Except for forests that have already been very much depleted in Pinar del Rio and Las Villas, no other major forest remains in Cuba until the eastern end of the Province of Oriente is reached, a distance of about 1300 kilometers. The Peninsula at its greatest length and width measures about 90 kilometers long by 35 wide, and halfway down its length is very deeply indented by the Ensenada de Corrientes dividing the Peninsula into two arms. The northern arm was not visited by us, the southern half of the Peninsula and the southern arm being the more interesting and rugged and the least disturbed. The ground is extremely rough, much of it covered by the sharp and jagged projections of the dogtooth limestone, or *seboruco* as it is called in Cuba, or the limestone is weathered into innumerable holes and pockets resembling a sponge. The south coast is an unbroken wall of high cliffs (Fig. 1) and, for some distance inland, the forest is separated from the sea by a wide zone covered by low xerophytic vegetation gradually replaced by a very dense, low scrub nearer the forest. No birds were observed in this zone, but it was the home of very large iguanas and bands of the Jutia Conga (*Capromys pilorides*) consisting of up to six individuals. This very large rodent is widely hunted for food, but on the Peninsula the fauna has been so little disturbed that the animals could be approached in the open to within a few feet.

The Peninsula de Guanahacabibes is threatened by ruthless exploitation. At present its only economic asset is the forest (Fig. 2), but on the northern arm, which is accessible from the sea, much of it has already been cut, according to Smith. On the southern arm the more valuable trees are rapidly

disappearing, and a large saw mill has been erected. Worst of all, it is beginning to be invaded by charcoal burners who use the smaller remaining hardwood species. Figures 3 and 4 show the depredations already suffered. This type of forest grows very slowly and, once it is destroyed, it is not likely to be replaced. When it is gone the Peninsula will be transformed into a wilderness of scrub and rock, as it has little soil and cannot be used for agriculture or grazing. The Peninsula, or at least its southern half, could

FIG. 1. Cliffs along the southern coast of the Peninsula de Guanahacabibes. Photograph by Fernando de Zayas.

probably be saved and turned into a permanent asset by developing it as a National Park. Its possibilities are many: campsites in the forest could be provided, it has a very striking coastline and an extremely fine, tree-shaded sandy beach at the Ensenada. Such beaches are rare in Cuba and would readily attract visitors. The tip of the Peninsula is only about 100 miles distant from Yucatán and could be used as a convenient base for sport fishermen.

ACKNOWLEDGMENTS

I would like to express my appreciation to our friends in Cuba for their cordial reception and their help. Chief of all to Ing. Fernando de Zayas, Jefe de la Defensa Agricultura, who helped us constantly and took us to the Peninsula. He is a keen entomologist and collector, knows the Peninsula well, and considers its insect fauna to be rich. Three of the photographs in this article were taken by him. Dr. Abelardo Moreno of the University of Havana received us in his home and I had the pleasure of discussing with him some of my observations on birds. He has also kindly read the manuscript and

made suggestions. Dr. and Mrs. I. D. Clement made our stay at the Atkins Garden and Research Laboratory at Soledad a very pleasant one and provided us with a vehicle which greatly facilitated our work. Help and hospitality were also given to us by Carlos Petersen of Casilda, Leonardo Sorsana of Ancón, and the officials of the agricultural experimental station at Topes de Collantes. Dr. Earl E. Smith kindly provided the photograph of the relatively undisturbed forest.

FIG. 2. View of the interior of the forest. Virtually all the larger trees have been removed, but those of medium size and the saplings have not been disturbed appreciably. The photograph was taken by Earl E. Smith near the south coast of the Peninsula, and the guide in the foreground is leaning on a block of eroded limestone. The tree that has been felled is a sabicú (*Lysiloma latisiliqua*).

SYSTEMATIC LIST

In the birds mentioned below, a complete list is given only in the case of the land birds observed on the Peninsula (this region is usually called only by the name of "el Cabo" and hereafter is called the Cape). These are the birds which could be seen readily, or, once heard, could be followed whenever possible. Because of lack of time, difficulty of the terrain, and other circumstances, an active search for other species was impossible. It will be noted, however, that on the Cape the birds of the open countryside or less densely wooded regions are conspicuous by their absence. The observations

below are not necessarily restricted to those made on the Cape and species observed in other regions are mentioned. In the case of the latter, the name of the bird is placed in brackets. The order and the nomenclature follow Bond's check list (1956).

Cathartes aura. Turkey Vulture; Tiñosa.—Ubiquitous in Cuba but nevertheless not expected in the forest. A total of three was found, however, on the road near the beach. The term "road" on the Cape is a very free expression.

Buteo platypterus. Broad-winged Hawk; Gavilán.—One adult at the Cape.

[*Falco sparverius.* Sparrow Hawk; Cernicalo].—The Sparrow Hawk was not found on the Cape as it is a bird of the open and cultivated country. In Cuba, as is well known, the birds show two color phases, one in which the underparts are white or creamy white and the other in which they are strongly rufous, often a very deep brick red. On several trips to the valleys of the region of Viñales in Pinar del Rio I have always been under the impression that both phases are about evenly represented. Birds of the red phase, in which the whole cheek was black or virtually so, also were seen often. In the series of 54 specimens from the mainland of Cuba in the collection of the American Museum of Natural History, 16 specimens are of the red phase and 38 of the white one. The series, which was collected mostly in central and eastern Cuba, does not include specimens from Pinar del Rio. In a few of the pale phase, the breast is slightly tinged with rust, and in a few of the red phase the cheek is invaded with black to a varying extent but, with the exception of one, is not wholly black. In a series of eight from the Isle of Pines, one is red and seven are white.

[*Colinus virginianus.* Bobwhite; Codorniz].—The Bobwhite is a common bird of grassy fields and open hill sides and therefore was not present on the Cape. In the provinces of Pinar del Rio and Las Villas they seem to be abundant, judging by the calls heard everywhere. In Viñales Valley, coveys of very young birds were flushed in the last days of July. The mongoose (*Herpestes*) was seen also, and I wonder to what extent it preys on this species.

Columba leucocephala. White-crowned Pigeon; Paloma de Casco Blanco.—Zayas tells me it breeds in good numbers in the mangroves that fringe the northern coast. Only two, probably a pair, seen flying along the beach at the Ensenada.

Columba squamosa. Red-necked Pigeon; Paloma Morada.—Three sets of two individuals each, probably pairs, feeding or walking on the road where the forest was most dense.

Columba inornata. Plain Pigeon; Paloma Ceniza.—This species is said by Bond (1947) to frequent rather open country, but two couples and odd individuals were seen in the heart of the forest. At one of our camp sites shortly after the dawn two sat stolidly in a dead tree for a long while. Not seen on the ground.

Zenaida aurita. Zenaida Dove; Sanjuanera.—Common and very vocal.

Columbigallina passerina. Ground Dove; Tojosa.—Much less common than in the open country, but several pairs seen along the more open stretches of the road.

Amazona leucocephala. Cuban Parrot; Cotorra.—The first individuals seen were two, perhaps a pair, calmly feeding or investigating the terminal branches of a tall tree. They paid no attention to us or to the groans of the laboring Jeep. Later, bands of four and of eight birds were seen several times flying just above the tree tops. Usually very noisy in captivity (see remarks below on migrants and pets), but all those seen were silent.

Saurothera merlini. Cuban Lizard Cuckoo; Arriero.—Common or at least very vocal. Usually seen slinking through bushes or the lower levels, but one individual seen hopping along the bare branches at the top of a tall dead tree.

FIG. 3. View near the edge of the forest where it borders the savanna. To the left of the road, beyond the screen of palms, all trees have been removed, the larger ones for timber, and the small ones and undergrowth for charcoal. Photograph by Fernando de Zayas.

[*Crotophaga ani*. Smooth-billed Ani; Judío].—This Ani is a common bird in Cuba, where it inhabits savannas or open cultivated country with a few trees, and therefore was not present at the Cape. Its life history in Cuba has been studied by Davis (1940) at the Atkins Garden and Research Laboratory at Soledad near Cienfuegos in Las Villas. The feeding habits of the closely related Groove-billed Ani (*Crotophaga sulcirostris*) of Central America were studied by Rand (1953). Both species feed chiefly on moving animals, mostly insects, but, according to Davis, the Cuban one changes its food habits with the season. During the dry season it subsists largely on vegetable matter, whereas in *sulcirostris* no such change is noticeable, according to Rand, and vegetable matter seems to be eaten sparingly. Both species follow cattle and, according to Davis, the Cuban bird learns readily to follow closely the footsteps of a man, or even a gasoline-powered mowing machine, to glean the insects disturbed. In view of the fact that the anis and Mrs. Vaurie and I are fellow insect collectors, I tried to see how successful they were but, strangely enough, I never saw them catch an insect.

Insect collecting this year was extremely poor and even our repeated sweeps of the grass and weeds hardly produced anything. This year, and we were told also last year, the rains were very late and the rainfall very low. Many ponds and small streams that we knew from former years were dry, and during the entire month of July, when normally it rains virtually every day, we had but one hard rain and two or three light showers. This probably accounts for the great scarcity of the insect species that feed

on grass and weeds. The bands of anis observed seldom numbered more than three or four, with one exception. In this case the band (or colony?) numbered 16 and was found along a road bordering a small field with drainage ditches filled with water emptying into a small stream. Very small frogs or toads and small lizards were numerous and probably were the chief source of food. Anis were seen not rarely in or near trees or bushes with small fruit.

Four days were spent at Soledad and I visited the sites of the colonies mentioned by Davis. There were no signs of breeding activity, as far as I could determine, anywhere in the Garden, July 20 to 24, and at the Bambusa Pond site, where the colonies numbered from 13 to 24 birds from June to August in 1937 and 1938, only two to three birds were seen. The grass was cut during our visit but the anis showed no particular interest in this activity. It probably was not worth the effort.

[*Tyto alba.* Barn Owl; Lechuza].—At least three individuals in the gardens of Soledad. They roost in the crowns of a very large exotic palm from Ceylon and India with huge fans about 10 feet or more across.

Caprimulgus cubanensis. Antillean Nightjar; Guabairo.—Several "singing" incessantly near our camp.

Chordeiles minor. Nighthawk; Querequeté.—Common. The nightjar and this bird probably breed along the south coast on the top of the bare cliffs or in the open zone near them. The Nighthawk is very common throughout Cuba, and not infrequently individuals can be seen hunting in broad daylight, even at noon when the sun is most intense.

The Cuban Nighthawk (*gundlachii*) has, as is well known, a totally different call than the Common Nighthawk (*minor*) of North America. Its call is polysyllabic, consisting of four rapidly spoken notes, rather than the single nasal or buzzing note of the nominate race. It seems also that, as a rule, the Cuban bird does not dive and boom, as is done by the males in North America during their courtship. These two birds are considered to be conspecific, but if, in addition to the very sharp difference in voice, the courtship performance is found to differ also to an important extent, our concept of their relationship may need to be altered.

I have never seen the Cuban bird dive and boom, but I have not been in Cuba during the mating season, which starts in March. Dr. Moreno writes me that he has seen the Cuban bird dive and boom, but "only twice." The possibility that it is a separate species has occurred to him, but he states that he has not reached a definite conclusion until he completes his studies of its courtship.

Chlorostilbon ricordii. Cuban Emerald Hummingbird; Zunzún.—Common. In the site selected for our first camp, an irregular clearing about 10 to 50 meters wide, many of these birds were seen quarreling violently and constantly with loud and exasperated shrill screams above a number of bushes covered with scarlet tubular flowers. On one occasion I counted 10 and probably others were out of sight. No sooner would an individual of either sex approach a flower than it would be pounced upon and driven off for a short distance, the two individuals indulging in all sorts of acrobatics during which the tail is spread open in a very wide deep "V." Elsewhere in the forest, as well as in the rest of Cuba where they are common also, it is rare to meet with more than one individual at a time, almost always at the same spot. Normally, they seem quiet for a hummingbird and often perch calmly for several minutes, usually in the shade, apparently resting or engaged in preening their feathers.

Mellisuga helenae. Bee Hummingbird; Zunzuncito.—This species apparently is rare, and on several trips to Cuba had been seen but once by me—in 1939 in a garden at Camagüey—although it was looked for on the other trips. Great was my delight, there-

FIG. 4. View of the interior of the forest. The road was built by loggers who removed all the large trees, but this part of the forest has not been invaded as yet by charcoal burners and the undergrowth is undisturbed. Photograph by Fernando de Zayas.

fore, when a male appeared at a smaller bush somewhat separated from those fought over by the Emeralds. It fed quietly for some seconds and was joined by a female of its species, and then by a male Emerald. The two species showed no signs of being aware of each other, moving about on the same bush about a foot or two apart. The contrast in the mutual behavior between the two species and the squabbling among the Emeralds a few feet away was very great. As Zayas wanted to take some pictures, the male *helenae* was captured easily in a sweep of the butterfly net and released a few minutes later unharmed. While held, it remained silent and at no time offered the slightest struggle. Its anxiety, if any, was expressed by one or two movements of the head and a few blinks. Zayas tells me that on several trips to the Cape he has seen but one male on each trip, always in the same vicinity. The Cubans that we talked to show much interest in this bird not only because they know that it is very beautiful but also because they have been told that the male is the smallest of all birds. Yet almost no one that we talked to had seen it. In the one that I held, the body, not counting the tail and bill, was barely over an inch long and the toes about the thickness of an insect pin of very small gauge.

Priotelus temnurus. Cuban Trogon; Tocoloro.—Common. Very stolid and quite indifferent to our presence. While we were trying to take a rest after lunch shortly after noon, an individual perched in full view about 20 feet away and over our heads and kept up his incessant song. We lost track of time but perhaps half an hour later the bird was still there, had not moved an inch, and was still singing. The song (or call) is

slow, rolling, and sonorous, and can either carry for a long distance or be much muffled. The Cuba vernacular when written *To co-loro* is a faithful rendition of it. The *To* starts with a swelling of the feathers of the breast, takes nearly a second to travel up to the swelling throat where it becomes a *co*, and then, with a slow nod of the head, the *loro* is slurred out through the partly opened bills. Sometimes the final *o* is held. It is monotonous and is repeated at irregular intervals varying from about 30 seconds to two minutes, but heard from a distance, rolling and echoing along the great limestone cliffs of Viñales, it is to me one of the most pleasant sounds in Cuba. In Viñales, which we visited at the beginning and again at the end of July, the amount of song had much decreased by the end of the month.

Todus multicolor. Cuban Tody; Pedorrera.—Only one seen at the Cape, in dense underbrush, but several heard.

Centurus superciliaris. West Indian Red-bellied Woodpecker; Carpintero Jabado.—Very common and very noisy.

Xiphidiopicus percussus. Cuban Green Woodpecker; Tajá.—Common in the forest, as in the rest of Cuba, but always less so than the Red-bellied. On several occasions I have seen the two species in the same tree without signs of animosity.

[*Tyrannus dominicensis.* Gray Kingbird; Pitirre Abejero].—This species is one of settled open regions and therefore does not occur on the Cape. It is mentioned only because, although it is extremely aggressive, I have never seen it molest the Loggerhead Flycatcher and vice versa.

Tyrannus caudifasciatus. Loggerhead Flycatcher; Pitirre Cantor.—Common and usually very noisy but a cheerful bird to see.

Contopus caribaeus. Greater Antillean Pewee; Bobito.—Common at the Cape in clearings or other more open areas, such as roadsides and the screen of trees behind the beach.

Petrochelidon fulva. Antillean Cliff Swallow; Golondrina.—About a dozen of these birds were disturbed by us when we descended into an underground cave in search of bats. These were the only ones seen on the Cape. They are very common elsewhere in Cuba.

Corvus nasicus. Cuban Crow; Cao Montero.—The only way I can tell this bird in the field from the Palm Crow (*C. palmarum*) is through its croaking, guttural voice, that of the Palm Crow being very nasal and high pitched and rather similar to the voice of the Fish Crow (*C. ossifragus*) of North America. A band of five had apparently spent the night in a tree at our camp, were very vocal or noisy in the early dawn, and spent fully 15 minutes in loud conversation.

Mimocichla plumbea. Western Red-legged Thrush; Zorzal Real.—Common at the Cape as elsewhere in Cuba. Bond (1947) has found this species to be rather shy but, at least in Cuba, the reverse is usually true, for in many localities it seems drawn to man not unlike the American Robin (*Turdus migratorius*).[1] Two nests were found at the Cape, one at about six feet from the ground in a thick bush and the other built at about eight feet in some tangled saplings. The latter was at our resting place on the beach, and was watched on and off for about three hours. During this period, an individual singing from conspicuous perches varying between 30 and 50 feet from the nest was observed on three occasions to change places with the bird that was incubating. Exact

[1]Ripley (1952:18) has merged the genus **Mimocichla** (of which the Cuban subspecies, **rubripes**, of **plumbea** is the type) with **Turdus**. I agree, however, with Bond (1956) that **Mimocichla** is sufficiently well characterized morphologically to be retained as a distinct genus. It differs from **Turdus** in having a very strongly rounded or graduated tail with large white tips, and, as shown in these notes, **M. plumbea** does not behave like a typical **Turdus**. Its song, also, is rather different. The song of **M. plumbea** is rather weak and consists chiefly of a jumble of notes, lacking the musical quality of a typical thrush song.

time was not kept but the intervals spent on the nest by both individuals seemed to vary between about 15 minutes, or perhaps a little less, to about 20. On one occasion the nest was left unattended for about 10 minutes.

The Zorzal was watched whenever possible. Its attitudes on the ground (see sketches in fig. 5) are somewhat similar at times to those of the American Robin and at other times similar to those of the Catbird (*Dumetella carolinensis*). When relaxed it holds itself not unlike a Robin, except that the tail is usually held horizontally or virtually so and the wing tip is never drooped so low. When more alert, the tail is cocked very high at a sharp angle, and it then looks and moves exactly like the Catbird, or, although more bulky, less slender, somewhat like the Northern Mockingbird (*Mimus polyglottos*). Generally speaking, when moving on the ground or through bushes and undergrowth, it

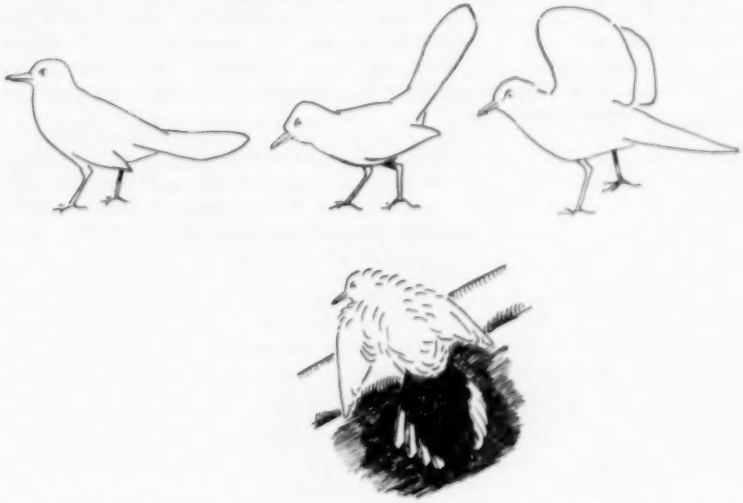

FIG. 5. Postures and display of the Western Red-legged Thrush (*Mimocichla plumbea*) from field sketches by the author.

more nearly resembles a large Catbird. It may be of some interest to note that the Cuban vernacular for the latter is Zorzal Gato. Its resemblance in behavior to that of the Catbird and Mockingbird is heightened during a phase of its courtship when it lifts its wing upwards and then "flashes" or waves them slightly.

This courtship performance, or what seems to have been almost certainly such a performance, was observed in the gardens of the agricultural experiment station at Topes de Collantes, Las Villas. In this garden were five Zorzals within a small open area. They seemed to pay no particular attention to one another with the exception of two individuals. These two were watched for about one hour, moving back and forth always to the same perches, namely the roof of a low shed, a fallen log about eight inches in diameter, a pile of crates and flower pots, and a small mound of earth about two feet high. One individual, no doubt the female, would move off to one of these perches, and was pursued closely and silently by the male. On alighting, the two would remain immobile for about two to three minutes. When she moved to the mound or log, the

male would alight to within two or three feet but remain on the ground and would either remain immobile, as on the shed, or would raise and "flash" its wings as shown in the sketch, meanwhile taking a few steps toward her. This display was varied by the one shown at the bottom of Fig. 5, which took place only on the log. The male would mount on the log, arch his whole body and tail forward with all the feathers erected and the tail spread open to its fullest extent, thus displaying the white tips most conspicuously. He remained perfectly immobile but this display would be interrupted at once and pursuit resumed when the female flew off. The part played by the female through the various phases described consisted, apparently, only in flying back and forth to the various perches, and most of the time her back was turned. Both birds were silent throughout and the other individuals in the garden paid them no attention.

Wing "flashing" is usually believed to be a means through which insect food is secured, the movements making the insects reveal themselves by moving, but Sutton (1946) believes that in the case of the Mockingbird it is only more or less accidentally associated with the capture of food. In the case of the Zorzal, as also in the case of the Catbird in which I have witnessed the same behavior, I have seen it to take place only during courtship performance.

As stated, the other individuals in the garden seemed to pay no attention whatever to the pair. Most of the time they apparently were searching for food, but the only insects we could find that they seemed to be taking were tiny ants and small flies. They also took some fruit, namely they would greedily pluck off and swallow in rapid succession several small red peppers about two-thirds of an inch long. Only the brightest and reddest were taken. I collected specimens of the plant and its peppers which were identified by Dr. I. D. Clement as the wild small-fruited form of *Capsicum frutescens*. The digestive system of the Zorzal must be quite insensitive. Only one of these peppers is enough to burn off the lining of my mouth, or so it feels, and if swallowed is so hot that it makes me break out in profuse perspiration. The name of the pepper in Cuba is "aji guaguao."

Vireo gundlachii. Cuban Vireo, Juan Chiví.

Vireo altiloquus. Black-whiskered Vireo; Bien te veo.—This vireo and the preceding were very common at the Cape. The Black-whiskered is the larger of the two, and, as in the Bahamas where I had the occasion to observe it (1953), I found that it feeds, sings, and very probably (though I did not find any nests) nests higher in the trees than the smaller species. The situation in Cuba is the exact parallel of that in the Bahamas where the Cuban Vireo is replaced by the closely related Thick-billed Vireo (*V. crassirostris*).

Teretistris fernandinae. Yellow-headed Warbler; Bijirita de Vuelta-abajo.—Common at the Cape, seen singly and in small parties. One foraging party composed of five or six of these warblers and two Cuban Bullfinches (*Melopyrrha*) was observed. Birds in the tropics traveling in mixed hunting parties undoubtedly derive benefit from such associations, but it seemed unusual to find a warbler associated with the Bullfinch, and I followed the party for a while and found that the individuals of the two species keep together by means of short sibilant calls. I found later that this association was not unusual. In the mixed woods above Viñales I came across several such parties, but in their case the Bullfinches were more numerous than the warblers. One of these foraging parties included a third species, namely a pair of Cabreros (*Spindalis*).

Mr. William Partridge has since called my attention to a paper by Neunteufel (1953), in which Neunteufel reports that on many occasions he has observed mixed hunting parties of insectivorous and of fruit- or seed-eating birds in the forests of Argentina (Misiones) and Paraguay. In several instances Neunteufel was able to observe the formation of these parties, and reports that the insectivorous birds were first attracted to the

trees by the disturbance caused to flying insects by the fruit- or seed-eating birds, and, once attracted, follow the latter from tree to tree.

Cyanerpes cyaneus. Blue Honey-creeper; Azulito.—One individual. Dr. Moreno told me that this species (which according to Bond is more numerous in eastern Cuba) seems to be extending its range westward.

Spindalis zena. Stripe-headed Tanager; Cabrero.—I saw only one pair at the Cape, but it is undoubtedly more common than this would indicate, and other individuals probably escaped my attention.

Melopyrrha nigra. Cuban Bullfinch, Negrito.—Very common.

Migrants, Cage Birds, and Bird-catchers

Zayas, who has visited the Cape during the spring migration, tells me that at this time the forest is alive with great numbers of birds, and that their numbers build up to recurring peaks, but he did not observe in what direction the birds take off. As the Cape is only 100 miles from Yucatán, it is possible they arrive from there and then, after resting, fly north across the Gulf or to Florida. It is also possible that the migrants may follow the Antilles and then fly north, or some perhaps cross to Yucatán. The Cape would seem to be an excellent location to study migration.

Cubans, like most people of Hispanic ancestry, are fond of pets and they usually care for them well. The Cuban Parrot is kept often in or out of a cage and makes a charming pet. This bird, however, is also still shot for food in some remote regions and, we were told, offered for sale as game at the price of a dollar a brace. Among native birds those most popular are first the Bullfinch, and then the two Grassquits or Tomeguines (*Tiaris olivacea* and *T. canora*), the latter the more popular of the two, as the male is the more striking. This summer, the asking price in the countryside for one Bullfinch, or a pair of either Grassquits, was one dollar, a small cage included. Other birds that I have seen in cages are the Cuban Trogon, the Red-legged Thrush, the Blue Honeycreeper, the Stripe-headed Tanager, and among migrants, the following warblers: Black-throated Blue (*Dendroica caerulescens*), Black-throated Green (*D. virens*), Yellow-throat (*Geothlypis trichas*), and the American Redstart (*Setophaga ruticilla*). The Painted Bunting (*Passerina ciris*) is especially popular. I have even seen caged House Sparrows, and among the non-passerines, and perfectly at liberty, the West Indian Tree Duck (*Dendrocygna arborea*) and the Sparrow Hawk. Around Viñales I have heard that in former years Sandhill Cranes (*Grus canadensis*) were kept as pets and in 1941 I saw one of these near Havana, tied by a small rope by the leg. The other leg had been broken and crudely splinted but the bird was able to limp on it. Though these were not pets, properly speaking, Limpkins (*Aramus guarauna*) frequented the kitchen steps at Soledad.

The most prized of all cage birds is, however, the Solitaire or Ruiseñor (*Myadestes elisabeth*). It is a very plain, unobtrusive species, but it is prized

for its lovely, flutelike song; it does rather well in captivity. We were asked 10 dollars for one individual in Havana. My introduction to Cuban birds came through this bird when in 1939 I spent a month in Viñales and on the first day met the local bird catcher whom I then paid to take me on his rounds. He was interested primarily, if not exclusively, in the Ruiseñor, and the most that I have seen him capture in one day was seven. Usually he caught only two or three and sometimes none. His price, wholesale, was two dollars each and sometimes, when he would keep a bird and train it, five dollars. His manner of catching these birds is of interest. His equipment consisted of two or three bamboo poles of different thickness which could be fitted into one another for the desired length and a number of very thin slivers of bamboo, about one-eighth of an inch wide and a foot long. These were kept in a quiver made of a section of bamboo that dangled from his belt; they were immersed in a viscid substance obtained from the latex of a wild fig tree, and then thickened over a fire with the addition of wood ashes. When a bird was seen, one of these slivers would be placed very loosely at the top of his poles; the bird was then approached and the sliver dropped quickly on its back. The bird would take off in alarm, but was not able to shake off the sliver that would stick to its back as well as to the wings, and he would flutter down to be caught. With the fingers the sticky substance was then rubbed off just as easily and cleanly as rubber cement from paper. Tying two of these slivers in the form of a cross, he caught easily for me birds as large and as strong as the woodpeckers, the trogon, and the Zorzal. All birds caught for me were studied in the hand, sketched, and released the next day. Bird catchers do not seem to threaten the Ruiseñor population seriously. In the limestone country the bird lives on the high cliffs (*mogotes*), many parts of which are inaccessible. In 1956 they seemed to be about as common, judging by the amount of song, as they were in 1939 and the bird catcher has now become a sanitation inspector. His skill and methods probably are a lost art.

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AMERICAN MUSEUM OF NATURAL HISTORY, NEW YORK 24, NEW YORK, JANUARY 17, 1957

THE CONTRIBUTIONS OF JOSSELYN VAN TYNE TO THE WILSON ORNITHOLOGICAL SOCIETY

BY A. W. SCHORGER

It will be left to future writers to describe the high rank earned among American ornithologists by Josselyn Van Tyne, who died in Ann Arbor, Michigan, on January 30, 1957. His formal publications may be easily assessed, but few people will realize fully his great contributions to the Wilson Ornithological Society.

He was born in Philadelphia on May 11, 1902. Following undergraduate work at Harvard, he received his doctorate in 1928 at the University of Michigan, with which institution he remained associated until his death. In 1931 he was made Curator of Birds and was instrumental in building the collections of the Museum of Zoology into one of the best among state institutions. Field expeditions to French Indo-China, British Honduras, Guatemala, Yucatán, Bahamas, Panamá, and Bylot Island, and regular attendance at the meetings of the International Ornithological Congress gave him a broad knowledge of the birds of the world.

He became a member of the Wilson Society in 1922 and up to the time of his death was present at all but four of its meetings. There was no interval during that time that he did not serve as a member of a committee or on the Council. From 1935 to 1937 he served as President. During his incumbency careful attention was paid to the business affairs of the Society, and to the programs of the meetings to give full satisfaction to the attendants. In his campaign to increase the endowment of the Society by securing life members, he was very successful.

It is as Editor of the Bulletin that his service was outstanding. During a period of ten years (1939–1948) as Editor, he paid particular attention to the quality and usefulness to the readers of the printed papers. Every issue involved a mass of correspondence, diplomatic handling of authors who consider their manuscripts sacrosanct, reading of proof, and endless minor details. Among the 175 papers published during his regime, there are some of particularly high quality, especially in taxonomy and behavior.

A request from members for comments and suggestions that would lead to a journal fulfilling the needs of the Society was among his first innovations. A bibliography of recent literature was added to the *Wilson Bulletin*, the articles being selected for usefulness to the members. A committee on illustrations was appointed to improve the latter. The December, 1941, issue inaugurated the use of attractive frontispieces, approximately one-third of which subsequently appeared in color. The 168 book reviews appeared under the signatures of persons best qualified to prepare them.

Aid to the younger ornithologists was unlimited. Contributors were re-

JOSSELYN VAN TYNE

quested to avoid using trinomials indiscriminately and attention was called to the fact that binomials were still in good repute. His office acted as a clearing house for research projects, not only to acquaint investigators with the work in progress but to avoid duplication.

He was unstinting in the time devoted to editing although it involved curtailment of his personal research and social life, and sacrifice of holidays. Happening to be in Ann Arbor during this period and desiring to use the library, I inquired if the Museum would be open on Saturday. He replied: "It is not only open on Saturday, but Sunday and evenings."

The Society is unique among purely American ornithological organizations in the founding and maintenance of a library. The proposal to establish a library was made by Frank C. Pellet at the meeting in Ann Arbor in 1928, and two years later an agreement was signed with the University of Michigan whereby the Museum of Zoology became the custodian. Dr. Van Tyne announced in 1939 that the official book-plate of the Society would be a design by George Miksch Sutton, carrying a drawing of the Long-eared Owl —"an appropriate bird since it is named after Alexander Wilson." He was an enthusiastic bibliophile and in his efforts to enlarge the library he made frequent appeals for donations of books and separates. Members were requested to forward a complete list of their publications so that items lacking in the library might be filled. As a result the library now contains approximately 635 books and 8,825 pamphlets. In view of this great service to the Society, the Council at its meeting in Duluth in June, 1957, voted to name the library in his honor, the Josselyn Van Tyne Memorial Library.

It was Dr. Van Tyne's desire that his private collection of books be kept intact insofar as possible. Helen Van Tyne has recently announced her decision to present this valuable collection to the Wilson Ornithological Society, to be incorporated into its library.

I saw him for the last time during the Thanksgiving holiday in 1956. A glance showed that he was very, very ill and it was poignant to find him meticulously reading proof on the Check-List of the American Ornithologists' Union. It would be difficult to find an example of greater devotion to a profession.

Department of Forestry and Wildlife Management, University of Wisconsin, Madison, Wisconsin, September 4, 1957

POPULATION DENSITY OF ALDER FLYCATCHERS AND COMMON GOLDFINCHES IN *CRATAEGUS* HABITATS OF SOUTHEASTERN MICHIGAN

BY ANDREW J. BERGER

THE dry upland nesting habitat of the Alder Flycatcher (*Empidonax traillii*) has been mentioned by several authors: Campbell, 1936:164; Wing, 1949:38; Berger and Parmelee, 1952:36; Meanley, 1952:111; King, 1955:149. Spiker (1937:48) said that the Alder Flycatcher in Iowa inhabited "dry, upland pastures, especially where there were rank growths of hazel bushes, wild crab, and hawthorn."

During the last two years in Washtenaw County, Michigan, I studied four additional areas, where hawthorns (*Crataegus* sp.) are the predominant shrubby vegetation. Each study area is sharply delineated on all sides by woods, cultivated fields, roads, or grassy pasture-land. Area *A* (Pittsfield Twp., Sect. 6) was used as a pasture through 1955, but not in 1956. Area *A* has a relatively uniform composition (*Crataegus* and various grasses and herbaceous plants), except that two ponds occupy an area of about one acre; the smaller pond dried up completely in 1956. This area is very much like that illustrated by Berger and Parmelee (1952:35). The other three areas (*B*, Pittsfield Twp., Sect. 5; *C*, Northfield Twp., Sect. 36; *D*, Superior Twp., Sect. 34) have not been grazed in recent years (10 years or longer), though all were pastured at one time, and have a lush undergrowth of herbaceous plants. These three areas also are characterized by having a few scattered trees (mostly *Acer*, *Populus*, and *Ulmus*) and some clumps and thickets of various shrubs (mostly *Cornus* and *Rubus*). Areas *B*, *C*, and *D* have some low pockets (occupying only a small part of each area), which hold standing water during the spring and early summer and which support a different flora (*Salix*, *Cephalanthus*, *Sambucus*, etc.). Of the 54 nests found in these four areas during 1956, however, all but one (in an elm sapling) were built in *Crataegus*. Table 1 presents certain information concerning Alder Flycatchers on the four areas in 1956. The population density was essentially the same in 1955, but I did not visit the areas that year until the middle of July, at which time the young had already left the nests built in early June. Because the adults were not banded, determination of the number of pairs was based primarily on the number of active nests at a given time. All population estimates, therefore, represent the minimum number of pairs in each area.

Little information is available on population density of the Alder Flycatcher. Wing (1949:40) reported an average of 9.2 breeding pairs per 100 acres of Palouse prairie in Washington; the flycatchers were "associated with the brush patches" on hillsides on a census area of 28.2 acres. King (1955) found 14 pairs per 100 acres of "alternately dense and open haw-

thorn thicket along a running stream" in southeastern Washington; over one-third of the nests found by King were built in *Rosa* sp. Meanley (1952) reported 17 pairs of Alder Flycatchers on an 18-acre tract of *Crataegus* and persimmon (*Diospyros virginiana*) in eastern Arkansas; 13 of 15 nests were located in *Crataegus*.

King (1955:154) reported the average height above ground of 42 nests as 32.4 inches (range of 16 to 66 inches) and that 83 per cent of 41 nests were between 20 and 40 inches above ground. If the one nest found 86 inches above ground (area D in Table 1) is excluded from the calculation, the average heights of ten nests in area D is 42.8 inches, thus indicating a very close average for the four areas; of the Michigan nests, 75.5 per cent were placed between 27 and 43 inches above ground. This seems to indicate, as King found in Washington, a "definite nest-height preference" by this species, but this seems to vary both geographically and ecologically. For example, Meanley reported the average height of 15 nests (13 in *Crataegus*) as 7.5 feet in Arkansas.

TABLE 1

POPULATION DENSITY AND NEST HEIGHT OF ALDER FLYCATCHERS IN *CRATAEGUS* HABITAT[1]

Area	Acres	Number of Pairs	Number of Pairs per 100 Acres	Nests Found	Nest Height Above Ground (inches)[2] Minimum	Average	Maximum
A	30	18	60	16	29	42.6	66
B	20	11	55	13**	27	42.4	67
C	19	11	57.9	14	32	39.0	55
D	15	11	73.3	11	29	46.7	86
Totals	84	51	60.7	54			

[1]One nest 37 inches from ground in 4-foot elm; all other nests in **Crataegus**.
[2]To bottom of nest.

By way of comparison, it might be added that at Geddes Pond (Ann Arbor Twp., Sect. 27), a typical marshy habitat about one mile from Ann Arbor, from nine to 12 pairs (about 45 pairs per 100 acres) of Alder Flycatchers have nested every year from 1948 through 1956. The average height above ground of 45 nests in this habitat was 54.6 inches (minimum, 38; maximum, 89 inches). Of these nests, 22 were built in ninebark (*Physocarpus opulifolius*), 9 in red osier dogwood (*Cornus stolonifera*), 8 in panicled dogwood (*C. racemosa*), 5 in willow (probably *Salix niger*), and one in hawthorn. One other nest (not included in the calculation above) was placed 7 feet 10 inches above ground in a willow.

Further data are needed on clutch size of the Alder Flycatcher in order to determine more accurately the ratio of three-egg clutches to four-egg clutches. Farley (1901:347) stated that four eggs are more common in Massachusetts.

Berger and Hofslund (1950:9) found 14 (60.8 per cent) of 23 nests with four eggs in Michigan. Berger and Parmelee (1952:34) found 19 (40.4 per cent) of 47 nests with four eggs in nests visited only once. In Washington, King (1955:164) found 42.4 per cent of 33 nests with four eggs. In the present study, 51.8 per cent of 54 nests held four eggs. This percentage is probably lower than the actual ratio because some nests were destroyed before the clutch was complete and still other nests were not found until the eggs had hatched. In the latter instance, the presence of three young in a nest does not prove that the clutch consisted of three eggs, because one cannot know whether or not dead young may have been removed from the nest.

In the present study, 36 (76.6 per cent) of 47 nests were known to be successful in fledging one or more flycatchers. Of 129 eggs laid in successful nests, 115 (89.1 per cent) hatched and 114 (88.3 per cent) young left the nest. Only three (all in area B) of the 54 nests were parasitized by the Brown-headed Cowbird (*Molothrus ater*). One of the nests was destroyed; each of the other two nests fledged one Cowbird, but no flycatchers.

King (1955:164) commented that "it is evident that this species acquires some degree of proficiency in flying within a day after leaving the nest." This is certainly true, and, in fact, my experience suggests that if the young are not disturbed (e.g., by daily weighing or by banding after the young are 10 days of age or older), they are able to fly well when they leave the nest. Moreover, if the fledglings are not disturbed, they may remain in the nest tree for at least one day even after they have actually vacated the nest itself.

The breeding season of the Alder Flycatcher in southern Michigan extends from the first week of June into the third week of August. Berger and Parmelee (1952:37) commented that "it remains to be determined whether or not late spring or early fall migrants also appear on the breeding grounds during this period." Although proof is very difficult to obtain, I now feel confident that migrant birds do not appear in the *Crataegus* habitat during the period mentioned above. In 1956, Alder Flycatchers continued to sing through the first 10 days of August, when some nests still held young, but after August 16, I saw only one Alder Flycatcher (August 24) in any of the *Crataegus* nesting habitats, though I spent much time there during the following month. Furthermore, the total population on the areas rapidly decreased during the latter part of July. The number of flycatchers observed on the areas after the third week of July was directly correlated with the number of active nests and the number of nests from which young had recently fledged.

Although few people would attempt to identify the species of *Empidonax* flycatchers during migration, much could be learned about their general behavior if specimens were collected. Answers to the following questions

are still needed: Do these species migrate together in loose flocks? Do they pass through deciduous woods or through shrubby vegetation along the margins of streams and marshes? What is the time-span of the migration period?

The Common Goldfinch

Nesting in the same habitats with the Alder Flycatcher is the Common Goldfinch (*Spinus tristis*), although the nesting season of the latter species usually begins four to six weeks later than that of the flycatchers (Berger, 1954:164). Table 2 presents information on Goldfinch nests in three of the same areas used in Table 1. All the nests included in Table 2 were built in *Crataegus*; density is based primarily on the number of simultaneously active nests, and, thus, indicates the minimum number of pairs on each area. Working with some color-banded birds, Stokes (1950:111, 116) believed that there was "a steady infiltration of birds and establishment of new territories" until the middle of August.

Table 2

Population Density and Nest Height of Goldfinches in *Crataegus* Habitat

Area	Year	Number of Pairs	Number of Pairs per 100 Acres	Nests Found		Nest Height Above Ground (inches) Minimum	Average	Maximum
A	1955	16	53	19	34	34	50.7	98
	1956	—	—	15				
B	1955	18	90	20	44*	38	54.4	85
	1956	14	70	24				
C	1955	39	205	66	120	32	48.7	81
	1956	26	136	54				

Three additional nests were built in elm saplings, 39, 43, and 54 inches above ground.

On 24 acres of "park and marshland" at Madison, Wisconsin, Stokes (1950:114–115) found breeding densities of 150 (1944), 225 (1946), and 250 (1947) pairs of goldfinches per 100 acres, and during 1947, he found 38 pairs nesting on 6.4 acres of marsh.

There is a notable difference in the distribution throughout the nesting habitat between the Alder Flycatcher and the Common Goldfinch. The Alder Flycatcher tends to be evenly spaced throughout the areas. The Goldfinch, on the other hand, seems, in general, to be semi-colonial in that the nests are situated in groups. Plots of an acre or more may have no nests, whereas another area, equal in size, may have several nests, even though the vegetation appears identical in the two areas. This grouping of nests was especially evident in area C. The average distance between seven Goldfinch nests in such a group was 23 yards; the minimum distance between two nests was 6.7 yards. There are exceptions, of course, but isolated nests are not often

found either in *Crataegus* or swampy habitats in southern Michigan. Nests along roadsides, in shade trees in towns, or along the edges of woods are more likely to be isolated from other Goldfinch nests.

The question of territorial behavior of the Goldfinch has been discussed by several authors. In his thorough study of the Goldfinch in Wisconsin, Stokes (1950:111–115) found that the "territory consists of the nest site and immediate area, but does not necessarily include food, water, or nesting material sufficient for the pair." This type of behavior is probably characteristic of the Common Goldfinch throughout most of its breeding range. Data presented by Batts (1948:52–54), as well as my own experience, suggest that the area defended may be a very small one, that immediately surrounding the nest; his data also suggest that individual Goldfinches differ considerably in their responses to the territorial instinct. Thus, I think that it has been pretty well shown by several authors that the Common Goldfinch defends its nest-site, but, at the same time, that this species tends to be semi-colonial during the nesting season. This social tendency has also been reported by Walkinshaw (1938:5), Nice (1939:123), and Nickell (1951:451).

Annual differences in nesting success are well illustrated by the data collected on Area C. In 1955, 60.6 per cent of 66 Goldfinch nests were successful in fledging one or more young. On the same area in 1956, only 33.3 per cent of 54 nests were successful; the outcome of three additional nests was in doubt. The low nesting success in 1956 is difficult to explain, because that same year at least 64.3 per cent (and possibly 71.4 per cent) of 14 Alder Flycatcher nests were successful. Stokes (1955:124–125) also found considerable annual difference in productivity during the three years of his study. One interesting fact is that, in the Ann Arbor region, 7.4 per cent of 121 nests observed in 1955 had six-egg clutches, whereas in 1956, 25 per cent of 80 nests has six-egg clutches. I found 29 six-egg clutches during 1955 and 1956. Some of these nests were destroyed or deserted and a few were visited only once, but all six eggs were known to hatch in 16 nests and 11 nests were successful in fledging six young.

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A STUDY OF SUMMER BIRD POPULATIONS NEAR TOKYO, JAPAN

BY H. ELLIOTT McCLURE

AS PART of a study of birds and their relationship to Japanese B encephalitis, an attempt was made to determine the population density of nesting birds, and seasonal changes in their abundance and age composition in a rural area bordering Tokyo. This great, sprawling city, encompassing rural as well as metropolitan areas, is the center of ornithological thought in Japan, and much has been written concerning the birds of the city and its environs. Austin and Kuroda (1953) described briefly the status of species which are found about Tokyo. Kabaya (1948, 1951) attempted accurate listing of species and their seasonal occurrence at Mt. Takao, a forested mountain about 600 meters high, located 25 miles west of Tokyo. But quantitative studies of birds in rural habitats in the Tokyo district do not appear to have been reported.

For the study of a breeding bird population reported here, a site that was roughly rectangular and included about 100 acres of upland farms was selected in Setagaya Ward on the southwest outskirts of Tokyo (Fig. 1). This acreage was part of a larger area which had been under observation since 1950. The site included most of the usual habitat segments characteristic of the district. Dominant trees of the 10 acres of wooded plots included several species of oaks (*Quercus stenophilla, Q. paucidentata, Q. myrsinaefolia*), chestnut (*Castanea puninervis*), beech (*Fagus japonica*), pine (*Pinus thunbergii*), *Zelkova japonica* (Ulmaceae), and *Cryptomeria japonica* (Taxodiaceae). Figure 2 shows a segment of the area dominated by *Zelkova* and chestnut. Bamboo thickets covering about four acres were mainly of the species *Phyllostachys reticulata* which forms such dense stands that no undergrowth can exist (Fig. 3). There were about two acres of farmyards, such as those shown in Fig. 4. A small stream crossing the study area was bordered with approximately two acres of dense shrubbery entangled with mats of vines and *Rosa multiflora*. There were about six acres of flower gardens and of nursery for young trees. As the area was also used for recreation there were about five acres of open lawn and pasture. The remainder included cultivated fields of barley, wheat, tomatoes, onions, radishes, and other truck crops which were rotated each year. The interspersion of these habitats and their approximate sizes are shown in Fig. 1.

During the period from March 11 through August 26, 1953, 24 weekly observations were made, and between April 17 and August 25, 1954, 20 weekly observations. The tallies were made along a route crossing the acreage 10 times in a north and south grid. Weather conditions during the mornings of observation were as follows; in 1953, four mornings were clear, seven partly

cloudy and 13 cloudy; in 1954, three were clear, five partly cloudy and 12 cloudy. It rained on eight of the mornings in 1953, and on three in 1954. Wind was not a factor either year, for in early morning there was rarely more than a light breeze. The temperature range was not great, between 50° and 70° Fahrenheit.

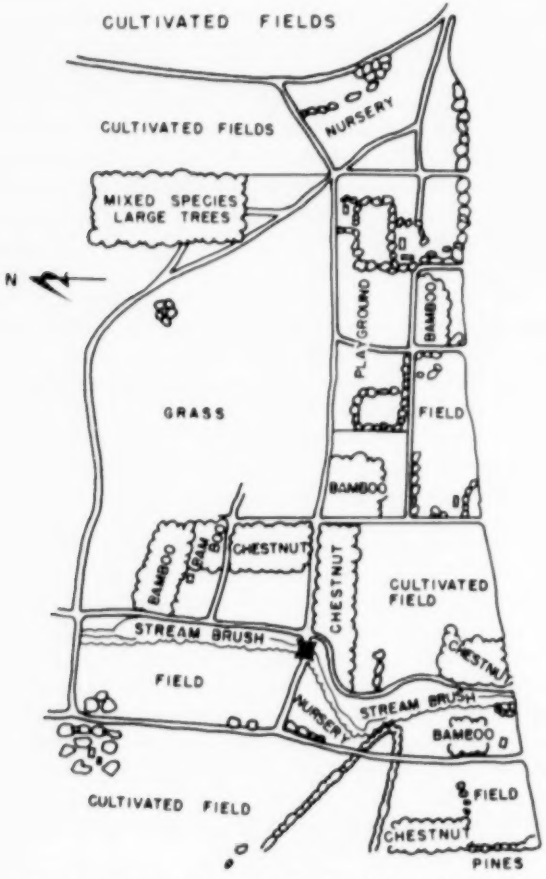


FIG. 1. Map of the Setagaya Breeding-bird Study Area.

A total of 6472 individuals, an average of 269 per trip, was tallied in 1953, and 5194 individuals, 259 per trip, were counted in 1954. There were 37 species recorded in 1953 and 30 in 1954, the difference being made up of

winter residents present in 1953 which had left by the time the 1954 study was started. Only 11 permanent residents and one summer resident were

FIG. 2. A segment of the study area dominated by *Zelkova* and chestnut.

TABLE I

THE AVERAGE NUMBER OF RESIDENT BIRDS NOTED WEEKLY PER 100 ACRES AT SETAGAYA, TOKYO-TO, JAPAN, DURING 1953 AND 1954

	April		May		June		July		August	
	1953	1954	1953	1954	1953	1954	1953	1954	1953	1954
Bamboo Pheasant	1.6	1.3	2.0	1.7	2.2	1.2	3.6	1.2	4.7	1.2
Turtle Dove	5.2	5.2	1.7	1.2	1.2	1.7	1.2	.2	0	.2
Skylark	8.0	6.2	9.3	6.7	5.5	5.5	5.0	6.0	4.0	3.2
House Swallow	.2	.5	1.0	4.0	4.0	4.0	8.0	6.5	8.0	2.5
Jungle Crow	1.8	.7	0	1.7	0	1.7	.6	.2	.2	.2
Carrion Crow	.6	1.8	2.0	1.2	2.7	1.7	3.6	3.2	1.7	5.0
Blue Magpie	3.6	3.0	1.0	.7	.5	1.0	.4	7.0	3.0	6.0
Bull-headed Shrike	1.0	2.5	1.3	2.2	1.5	2.7	2.0	1.2	1.7	1.0
Ashy Starling	7.8	9.5	13.0	6.7	32.0	13.7	42.2	49.5	109.7	125.2
Tree Sparrow	85.6	101.7	98.3	138.0	192.0	221.0	280.0	216.0	374.0	167.0
Greenfinch	2.6	2.8	1.0	.5	1.0	0	1.2	.7	2.5	0
Meadow Bunting	5.0	2.5	5.2	2.5	7.5	4.7	6.4	1.7	6.5	1.7
Misc. Species	62.0	31.5	8.2	14.4	.6	5.1	3.8	1.0	1.6	1.8
Totals	185.0	169.2	144.0	181.0	249.7	264.0	358.0	294.4	417.0	315.0

regularly seen each summer. These are listed in Table 1, and the average numbers tallied are compared by month and year.

The most striking facts shown by this table are the paucity of species and individuals in such a group of habitats, and the domination by Tree Sparrows. No similar habitat in America has been studied and reported in *Audubon Field Notes* in the past five years. However, an area in Missouri under observation by P. B. Dowling and his group was located in a deciduous forest region at about the same latitude. In Table 2 are presented Dowling's tally of breeding males per 100 acres of mixed farmland in 1954 as compared with the breeding males found on the Setagaya location. Dowling did not explain why the English Sparrow (*Passer domesticus*) was not evident on the

TABLE 2

A COMPARISON OF THE SUMMER BIRD POPULATIONS OF A FARMING AREA IN MISSOURI AND THAT AT A SIMILAR LATITUDE NEAR TOKYO, JAPAN

Habitat Group	Missouri[1]		Tokyo-to
Total Acres	86		100
Oak Woodland	18		10
Bamboo thicket			4
Farmyards	2 (abandoned)		2
Stream Border			2
Nursery and Garden			6
Lawn and Pasture			5
Cultivated Field	37		71
Fallow (Brushy)	16		
Open Parkland	12		
Pond	1		
Ecologic Counterparts — Estimated Males per 100 Acres			
English Sparrow	0	Tree Sparrow	40
Field Sparrow	47	Meadow Bunting	4
Bob-White	10	Bamboo Pheasant	1
Meadowlark	9	Skylark	6
Common Starling	7	Ashy Starling	2
Barn Swallow	0	Barn Swallow	2
Eastern Kingbird	5	Bull-headed Shrike	2
Mourning Dove	4	Turtle Dove	1
American Goldfinch	4	Greenfinch	1
American Crow	1	Carrion Crow	1
Other Breeding Species	36		0
Total Species	44		10
Males per 100 acres	265		60
Times observed	15		20
Hours of observation	86		50

[1] Data from Dowling and others, 1954.

Missouri plot. Its counterpart, the Tree Sparrow (*Passer montanus*), was the most abundant form at Setagaya. Obviously the two areas compared do not have equivalent numbers of ecologic niches. The climate at Setagaya is much wetter than that in Missouri, and the foliage denser (where it is permitted to grow). The Setagaya area was mainly under cultivation, while much of the Missouri area was reverting to woodland. There were probably many more niches available in the Missouri area than there were at Setagaya. However, the paucity of species and numbers of birds would lead to the conclusion that many of the niches at Setagaya remain vacant in the breeding season. Probably the primary cause of the low level of this bird population is human pressure against the birds, since the human population density is 30 per acre or seven times that of the birds.

Seasonal changes in population levels of the Tree Sparrow and Ashy Starling (*Sturnus cineraceus*) in the Setagaya plot are illustrated in Table 3. As young were fledged, or birds from surrounding farms flew into the study plot to feed, the percentage of the population made up of Tree Sparrows increased each year from April until mid-summer. If the population as observed in

TABLE 3

POPULATION CHANGES NOTED IN THE BIRDS OF SETAGAYA, JAPAN, IN 1953 AND 1954

	Year	April	May	June	July	Aug.
Tree Sparrow, *Passer montanus*						
Per cent of the total population	1953	46.0	70.5	76.9	78.5	72.7
	1954	60.1	76.2	83.7	73.3	53.0
Ratio of average weekly population compared with that of April	1953	1.00	1.14	2.24	3.27	4.37
	1954	1.00	1.35	2.18	2.12	1.64
Rate of population change from month to month	1953	1.00	1.15	1.95	1.45	1.34
	1954	1.00	1.35	1.60	.98	.77
Ashy Starling, *Sturnus cineraceus*						
Per cent of the total population	1953	4.2	9.0	12.8	11.8	26.3
	1954	5.6	3.6	5.1	16.8	39.6
Ratio of average weekly population compared with that of April	1953	1.00	1.66	4.10	5.41	14.10
	1954	1.00	.70	1.44	5.21	13.10
Rate of population change from month to month	1953	1.00	1.66	2.46	1.31	2.45
	1954	1.00	.70	2.04	3.61	2.53
10 additional breeding species						
Ratio of average weekly population compared with that of April	1953	1.00	.83	.85	1.08	1.09
	1954	1.00	.82	.90	1.05	.79
Rate of population change from month to month	1953	1.00	.83	1.02	1.25	1.02
	1954	1.00	.82	.90	1.05	.75
Total population per acre per month	1953	1.85	1.44	2.49	3.58	4.17
	1954	1.69	1.81	2.64	2.94	3.15

April is given a value of 1 and the population of other months compared with that of April, it will be seen that the population increased steadily during the summer of 1953 until it was four times as great in August as it had been in April. In 1954 the population increase was not as great and the peak was reached in June. A reduction in grain crops in 1954 probably accounted for this reduction in sparrows. The rate of change in population each month can be determined by dividing the observed population of a given month by that of the preceding month. By this method June appeared to be the month of most rapid increase each year.

FIG. 3. One of the bamboo thickets in the Setagaya study area.

Not more than two pairs of Ashy Starlings nested in the study plot each year, the majority using tree holes in nearby residential districts. When the young have been fledged the families remain together and join other families to form flocks that roam the surrounding countryside. Movement of these flocks into Setagaya is reflected in the figures given in Table 3, showing the August population to be 13 or 14 times as great as that for April. The rate of population increase was greatest in July of 1954, but was of equal magnitude in June and August of 1953.

The population levels of the other 10 species breeding in Setagaya were so low that little can be said about them. When totaled they showed only slight increases in late summer over the April numbers. The period of most rapid population increases appeared to be in July.

TABLE 4

THE AVERAGE NUMBER OF BIRDS TALLIED PER CENSUS VISIT IN THE ENTIRE SETAGAYA 360-ACRE STUDY AREA OVER A FOUR-YEAR PERIOD, 1951 THROUGH 1954

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
Black-crowned Night Heron	1.5	.7	1.7	4.7	1.0	.5	1.5	0	.8	0	1.0	.5
Bamboo Pheasant	.7	.2	.5	2.5	1.5	2.7	4.0	7.2	3.0	2.5	.2	1.0
Eastern Turtle Dove	11.0	12.5	6.2	9.0	2.7	4.2	3.5	2.5	2.2	4.2	6.0	11.2
Skylark	1.7	3.0	8.7	11.5	11.0	11.7	6.7	4.2	.8	2.5	.8	2.2
House Swallow				.2	7.2	7.5	17.0	29.5	13.3			
Jungle Crow	6.0	3.2	3.7	4.2	5.0	4.2	1.0	1.5	5.0	8.2	2.2	6.8
Carrion Crow	0	1.0	1.7	0	1.5	1.2	4.2	2.0	1.0	6.0	5.2	3.5
Blue Magpie	11.2	1.7	15.0	16.0	13.5	6.7	13.0	15.0	15.0	19.0	18.0	13.8
Bull-headed Shrike	5.0	4.7	3.5	1.5	2.5	3.0	2.5	1.5	5.0	13.8	8.2	6.0
Ashy Starling	18.0	13.7	10.5	8.2	15.2	64.7	57.0	194.2	79.0	10.5	9.0	6.8
Tree Sparrow	269.0	200.0	126.0	132.0	136.0	257.0	385.0	366.0	375.0	250.0	190.0	189.0
Greenfinch	8.0	6.2	33.0	6.5	1.7	6.5	1.7	3.2	.2	3.5	22.0	32.2
Meadow Bunting	24.2	23.7	16.7	11.2	5.5	8.0	9.5	6.5	3.0	4.8	19.0	12.0
Total, all species	440.0	350.0	337.0	272.0	229.0	386.0	516.0	649.0	525.0	468.0	366.0	389.0

The number of birds seen each month slowly increased in each year from April into summer. The total population reached approximately 4 birds per acre in August.

The 100-acre breeding bird census plot was a little less than one third of a greater area in Setagaya in which birds were tallied once a month during the four years from January, 1951, to January, 1955. Table 4 lists the 12 species commonly found during all months of the year, and includes the summer resident House Swallow as well. It will be noted, by comparison with Table 1, that there are no major differences in population pattern between the breeding-bird study area and the larger plot. Therefore it is believed that the study plot was representative of the farming district in Setagaya.

Following is a discussion of each of the common species observed.

Nycticorax nycticorax. Black-crowned Night Heron.—This common night heron, of circumpolar distribution, did not nest in the breeding bird census area. A small colony of four or five pairs nested in the tops of tall pine trees in a nearby grove. An abundant coastal species in central and southern Japan, it nests in great colonies in association with four species of egrets. Individuals or small groups may be found roosting in dense trees during the daytime throughout the year in coastal or low mountain woodlands.

Bambusicola thoracica. Bamboo Pheasant.—This species preferred woody cover in association with tree bamboo or sasa (low bamboo) and was found most commonly in the areas shown in Fig. 5. Pheasants nested in the dense thickets of the stream sides and rarely led their chicks from this cover. The cocks crowed each morning during the breeding season and occasionally at other seasons, and tallies were based upon the number

heard crowing. Even though heavily hunted the population appeared to remain at a fairly uniform level.

Streptopelia orientalis. Eastern Turtle Dove.—Although this large dove is a permanent resident, it reached greatest abundance in the Tokyo area during the winter, when local populations were augmented by migrants from Hokkaido and northern Honshu. It is not a farmyard species as is the Mourning Dove of America, but prefers to nest in brush land or in second-growth timber. The breeding population in Setagaya was low, and tallies reflected the movement of winter concentrations from the area. Instead of showing a rise in numbers from the production of young, there was a steady decrease throughout the summer as the species moved into more desirable habitats. The nest is a typical dove's nest, loosely woven and usually placed in a low crotch.

FIG. 4. A typical farmyard of the Setagaya area.

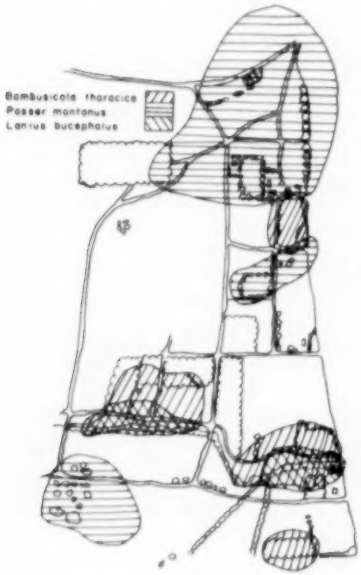
Alauda arvensis. Skylark.—The aerial performance of this palaearctic species was seen over all open, cultivated or noncultivated lowland habitats of Japan. It was a permanent resident of the farmlands reaching peak numbers in early summer. Since Skylarks nested early, the population was increased by juveniles during April, May and June. Population counts were based both upon calling males and flushed females or young; and the areas where Skylarks were commonly seen are shown in Fig. 6. The gradual reduction in numbers from month to month as shown in Table 1 reflected the gradual reduction in song performance rather than an actual decrease in numbers of birds. Because the nests are hidden at the bases of clumps of grass and are very difficult to find, none was discovered during the two years of early morning tallies.

Hirundo rustica. House Swallow.—The House or Barn Swallow was the only abundant summer resident in the area. It arrived from the south in April, reached peak numbers in August, and left in September. The species nested in or about farmhouses and foraged over open fields.

Corvus levaillantii, Jungle Crow, and *C. corone,* Carrion Crow.—These two species ranged over the entire study area. The Jungle Crow did not nest on the 100-acre plot,

but ranged over it from nearby nesting territories. In 1954 a Carrion Crow nest was placed in a tall *Zelkova* tree near the southeast corner of the plot, and the daily range of this pair extended beyond the limits of the 100 acres. The family flock was present in July and August.

Cyanopica cyanus. Blue Magpie.—Also ranging over the breeding area, but not nesting in it, were Blue Magpies. Their jay-like nests were placed in pines and *Cryptomeria* one-half mile or more from the plot. As shown in Table 4 this species was present in small



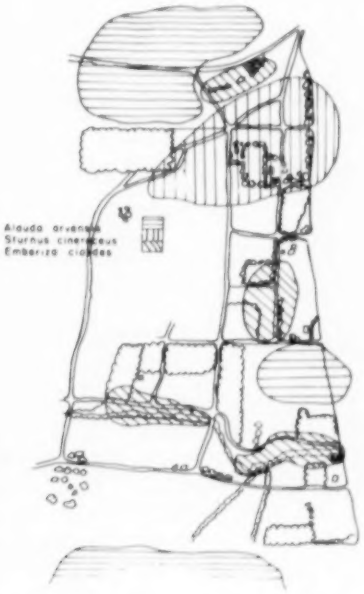


FIG. 5. (*left*) Distribution of *Bambusicola thoracica, Passer montanus* and *Lanius bucephalus* in the study area.

FIG. 6. (*right*) Distribution of *Alauda arvensis, Sturnus cinetaceus* and *Emberiza cioides* in the study area.

numbers throughout the year. In the breeding bird census area (Table 1) fewer were noted in May and June as nesting activity kept the parents closer to the nest. Usually five to seven young are fledged and they remain with the parents until late in the year.

Lanius bucephalus. Bull-headed Shrike.—This species was conspicuous, but not abundant. It nested very early each year and young were usually fledged by the end of March or middle of April. The observation of nestings late in May suggested that there may be two broods. After the young were fledged the family group remained in thickets along the creek (Fig. 5), where the shrikes were secretive during July and August. An influx of migrants and winter residents into the Kanto Plain from the north brought the population up to a peak in October (Table 4).

Sturnus cineraceus. Ashy Starling.—Figure 6 shows the habitats commonly used by this second most abundant species in the breeding area. Starlings nested in tree hollows or in thatched roofs of farm buildings. The daily range during nesting activities did not appear to extend much outside of that shown in Fig. 6, but after young were fledged the starlings gathered into flocks which included several families and roamed over the countryside. Foci of such wanderings appeared to be the original nesting or roosting place of the birds that had been there at the beginning of the nesting season.

Passer montanus. Tree Sparrow.—The sparrows' daily wanderings centered around farmyards (Fig. 5). They raised at least three broods, from April into August, preferring the interstices of tiled roofs of farm buildings as nesting places. After the young were fledged they joined adults and fed with them in the fields of ripening grain. These flocks returned each evening to the farm buildings where they roosted.

Chloris sinica. Greenfinch.—This was the most sporadic resident of the Setagaya breeding area. No nests were found, although a male had a singing perch on the top of a tall *Cryptomeria.* This was a common winter resident with peak numbers in March when migrants passed through on their way north. Breeding residents were most commonly found associated with large trees.

Emberiza cioides. Meadow Bunting.—A common, brush-loving species, the Meadow Bunting was found most often in the areas shown in Fig. 6. Males sang from the tops of the higher trees in their nesting territories. The song cycle was a long one, lasting from January until October. Two broods commonly were raised. The neatly woven cup-shaped nests were usually placed at a height of less than five feet in the crotches of shrubs in dense thickets. The population pattern, including singing males and flushed birds, is shown in Table 1.

Summary

Bird populations were tallied in weekly observations made at sunrise during the periods from March 11 through August 26, 1953, and April 17 through August 25, 1954, on a 100-acre plot of upland farms and farmyards at Setagaya, near Tokyo, Japan. Twelve species, including one summer resident were regularly recorded. The two most abundant species were the Tree Sparrow (*Passer montanus*) and the Ashy Starling (*Sturnus cineraceus*). The total population recorded increased from fewer than two birds per acre in April to nearly four birds per acre in August. Population changes of the 12 species are discussed.

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NOTES ON REPRODUCTIVE ACTIVITIES OF ROBINS IN IOWA AND ILLINOIS

BY W. D. KLIMSTRA AND W. O. STIEGLITZ

FIELD observations made in Iowa from 1946 through 1948, and in Illinois during 1955 yielded data on nesting and reproduction of the American Robin (*Turdus migratorius*). In Iowa, the observations were made in Ames, Eldon, and a rural area 4 miles southeast of Eldon, representing, respectively, central and southeastern localities in the state. Ames is situated at 42° North Latitude, and Eldon at 40.5°. In Illinois, data were collected from within the city limits of Carbondale, which is about 200 and 275 air miles south of Eldon and Ames, respectively, and 37.4° N. The observations made in Iowa were restricted largely to nest site, clutch size and hatching success, whereas in Illinois they included general breeding activities. Records from 173 nests were available for study; 112 in Iowa and 61 in Illinois.

Phenology of Nesting

The first nest in the Carbondale area was completed on April 1, three weeks after the peak of the Robin migration had passed through this area. The initial nest-building activities continued until April 23, with the peak of construction occurring from April 10 to April 15 when 70 per cent of all observed nest construction took place. In Iowa, first nests were recorded on March 15, 1946; April 6, 1947; and April 9, 1948, with the peak of initial nestings falling within the period from April 18 to April 28 in each of the three years. There was some indication that nesting around Eldon was five to 10 days earlier than at Ames. Data for 1947 and 1948 available from a study in Wisconsin (Young, 1955) showed the peak of activity to be 10 to 20 days later than in Iowa (125 air miles north of Ames, 43.5° N.). The unusually early nesting in Iowa in 1946 may have been a response to the abnormally high temperatures in late winter and early spring, especially those of March when the mean was 11.7° F. above normal. The slightly later peak of activities in Iowa and Wisconsin probably reflected the effects of the more northerly climatic conditions. Because studies in Carbondale were not conducted after early June, dates for later nests were not available. In Iowa the latest dates for nest establishment were August 3 (1946), August 9 (1947), and August 26 (1948). These dates are significantly later than those reported by Young (1955), for July 22 was the latest date recorded in Wisconsin.

Nest Construction and Location

Without exception, females established the nesting site only after several possible locations were investigated. Methodical inspection of the crotches of trees, such as reported by Meuli (1935), was not observed. Howell (1942) believed that both members of the pair took part in selection of nest sites, whereas Howe (1898) expressed

the opinion that this activity was limited solely to the female.

As observed by others (Howe, 1898; Howell, 1942; Burns, 1924), nest construction was accomplished by the female. During nest building activities, the male was often perched nearby, but in no case did he give aid. Construction of the nests in the Carbondale area required from three to six days; the average for 18 nests was 3.5 days. The time utilized was dependent seemingly upon weather conditions and availability of nesting materials. Composition of three nests analyzed on a weight basis proved to be approximately 35 per cent mud, 35 per cent dried grass, 25 per cent weedy stems, and 5 per cent miscellaneous items (twigs, string, pieces of paper, cotton, and cloth). The approximate average dry weight of these nests was 205 grams.

A wide variety of structures are utilized as nesting substrates. Howe (1898) states that Robin nests were observed on buildings, old carriages, and woodpiles, in addition to those found in trees. Miller (1918) and Blincoe (1924) report nests on the ground. Stewart (1931) observed a pair of Robins nesting within a tree cavity. Of the nests under observation during this study (Table 1), 97.7 per cent were constructed in trees, 1.7 per cent on buildings, and 0.6 per cent in shrubs. Twenty-nine species of trees were utilized for nesting, but only eight (3.7 per cent) of the nests were located in coniferous species. Howell (1942) reported that 57.6 per cent of the early nests in a New York study were located in conifers and 25.4 per cent in deciduous species; later nestings, however, showed a reverse trend. It should be pointed out that conifers are much more abundant in New York than in most of the Midwest.

Of interest was the relative position of nests in trees characterized by a main trunk with prominent forked branches extending upward and outward, such as is characteristic of the elm (*Ulmus*) and maple (*Acer*) trees. Of the nest sites in these trees, 62.8 per cent were constructed in the first fork of the main trunk. Less than 25.6 per cent (11) of the nests were more than three feet from the main trunk. Such sites possibly offered greater stability, and were better protected from wind than those situated on limbs away from the trunk.

In Iowa, nest height above the ground varied from 5 to 45 feet, whereas those in Illinois ranged from 5 to 35 feet. Mean heights for the two areas were 10.7 feet and 15.4 feet, respectively. Young (1955) reported a mean height of 7.4 feet. In Ithaca, New York, 50 per cent of the nests were within 10 feet of the ground (Howell 1942).

Clutch Size

Sizes of 29 completed clutches (nest known to have been incubated) in the Carbondale area ranged from 1 to 5 eggs, showing a mean of 3.17. In Iowa 81 completed clutches numbered from 2 to 4 eggs with a mean of 3.44, which was almost identical to the value (3.4) reported by Young (1955). Possibly the slightly larger average clutches for Iowa and Wisconsin indicate a climatic relationship resulting in greater reproductive rate among species in the northern parts of their range. Abnormally large clutches (8 eggs), as reported by Keyser (1908) and Loveridge (1939) were not observed.

TABLE 1

NESTING SITES OF THE AMERICAN ROBIN IN ILLINOIS AND IOWA

	No. of nests	Per cent of total
Trees		
Deciduous species (95.3 per cent)		
American elm (*Ulmus americana*)	57	32.9
Box elder (*Acer negundo*)	28	16.1
Black maple (*Acer nigrum*)	10	5.8
Silver maple (*Acer saccharinum*)	8	4.5
Red maple (*Acer rubrum*)	6	3.5
Apple (*Malus pumila*)	6	3.5
Black willow (*Salix nigra*)	4	2.3
Green ash (*Fraxinus pennsylvanica*)	4	2.3
Norway maple (*Acer platanoides*)	3	1.8
Red mulberry (*Morus rubra*)	3	1.8
Wild plum (*Prunus hortulana*)	3	1.8
Sycamore (*Platanus occidentalis*)	3	1.8
Osage orange (*Maclura pomifera*)	3	1.8
White oak (*Quercus alba*)	3	1.8
Peach (*Prunus Persica*)	3	1.8
Sugar maple (*Acer saccharum*)	2	1.1
Catalpa (*Catalpa speciosa*)	2	1.1
Wild cherry (*Prunus serotina*)	2	1.1
Wild crabapple (*Malus ioensis*)	2	1.1
River birch (*Betula nigra*)	2	1.1
Persimmon (*Diospyros virginiana*)	2	1.1
Black walnut (*Juglans nigra*)	1	0.6
Post oak (*Quercus stellata*)	1	0.6
Shingle oak (*Quercus imbricaria*)	1	0.6
Dogwood (*Cornus florida*)	1	0.6
Pig nut hickory (*Carya glabra*)	1	0.6
Coniferous species (4.5 per cent)		
White pine (*Pinus strobus*)	2	1.1
Shortleaf pine (*Pinus echinata*)	1	0.6
Red cedar (*Juniperus virginiana*)	5	2.9
	169	97.7
Shrubs		
Coralberry (*Symphoricarpos orbiculatus*)	1	0.6
	1	0.6
Other Structures		
Houses	2	1.1
Corn granary	1	0.6
	3	1.7
TOTALS	173	100.0

Incubation

In all observed cases, the female accomplished incubation. The male was usually perched nearby, and on several occasions was noted to drive off other species which ventured near the nest. No instances of "incubation feeding" by the male, as reported by Brackbill (1944), were observed. During the early stages, the nest was vacated for fairly long periods for feeding, but as the time of hatching approached, the nest was left infrequently and then for very short periods. Only two cases of nest desertion were observed following the commencement of incubation.

Hatching and Nesting Success

In the Carbondale area the peak of hatching for spring nesting occurred from April 23 to May 1; 77 per cent of the nests hatched during this period. The earliest date on which a brood hatched was April 20. In Iowa 68 per cent of the nests were recorded hatching during the first 10 days of May. The earliest hatchings were on April 9 in 1946, April 20 in 1947, and April 26 in 1948. The peak of hatching reported for Wisconsin (Young, 1955) appears to occur about 20 to 30 days later than that in southern Illinois and 10 to 20 days after that observed in Iowa.

Of the 61 nests found at Carbondale, Illinois, only 31 could be considered for an evaluation of hatching success, since 30 nests contained no eggs during the period of study. One or more eggs hatched in 29 (93.5 per cent) of the 31 nests with eggs. Hatching success for nests observed in Iowa was found to be 48.6, 51.0, and 42.0 per cent for 1946, 1947, and 1948, respectively. Howell (1942) and Young (1955), reporting on success of nests which contained one or more eggs, showed 64.7 and 48.8 per cent hatches in New York and Wisconsin, respectively. An analysis of nest data by Kendeigh (1942) revealed a success of approximately 82 per cent for the American Robin, whereas an extreme of only 13 per cent was recorded by Thomsen (1944).

Ninety-four per cent of the eggs deposited in nests in the Carbondale area hatched, in comparison to 79.6 per cent in Iowa. Data presented by Howell (1942), Young (1955), and Kendeigh (1942) showed hatches of 60.6, 57.6 and 86.0 per cent, respectively.

The rural nesting sites assured greater safety to nesting birds than did those within urban areas in Iowa. Rural nests (49) showed 69.0 per cent success compared with 32.7 per cent for 63 urban nests. It was believed that the virtual absence of house cats (*Felis domesticus*) from the rural areas was a major factor contributing to the observed differential in rates of nesting success.

Data on the factors responsible for nesting losses were accumulated for 38 nests; wind, predators, miscellaneous factors and human interference were found responsible for 41, 29, 21 and 9 per cent of the losses, respectively.

Acknowledgments

The data from Iowa were collected while the senior author was a research associate and fellow with the Iowa Cooperative Wildlife Research Unit. The research at Carbondale was sponsored by the Cooperative Wildlife Research Laboratory as Project No. 49, Songbird Studies. The authors wish to acknowledge the valuable advice and criticisms offered by Drs. Thomas G. Scott and Richard Graber of the Illinois Natural History Survey.

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DISTRIBUTION OF THE PALM WARBLER AND ITS STATUS IN MICHIGAN

BY LAWRENCE H. WALKINSHAW AND MARK A. WOLF

ALTHOUGH the Palm Warbler (*Dendroica palmarum*) is known in most of the eastern United States as a migrant or winter visitant with a breeding range lying almost entirely in Canada, it has been known to breed in northern Minnesota, and evidence of its breeding in Michigan and Wisconsin has accumulated in recent years. This report is concerned principally with the western form, *D. p. palmarum*, most individuals of which are distinguishable in the field from the eastern race, *D. p. hypochrysea* (see Peterson, 1947: plate 49). The western form breeds from central Ontario westward in favorable wooded habitats through Manitoba, central and northern Saskatchewan and Alberta to northeastern British Columbia and into southern Mackenzie (Rand, 1944*b*).

ACKNOWLEDGMENTS

We wish to thank the following people for their help in the preparation of this paper: A. E. Allin, James L. Baillie, Fred G. Bard, Laurence C. Binford, Walter J. Breckenridge, Betty Darling Cottrille, W. Powell Cottrille, Keith L. Dixon, William A. Dyer, W. Earl Godfrey, C. J. Henry, W. A. Lunk, R. A. Paynter, Jr., William Rowan, T. M. Shortt, and Francis Zirrer.

SPRING MIGRATION IN MICHIGAN

The western race of the Palm Warbler begins its migration northward by late March (Bent, 1953:447), and reaches Michigan during late April. At Ann Arbor, Washtenaw County, Michigan, the earliest records (Wood and Tinker, 1934:44) in the first half of a 50-year period ending in 1930 were April 26 (1886 and 1888). During the second 25 years the earliest date was April 21 (1919). In this latter period 17 dates fell between April 21 and April 30, and six in early May.

Near Battle Creek, Calhoun County, Michigan, Walkinshaw observed the species on 41 different days between April 24 (1948) and May 21 (1931 and 1944). Seven observations were in April, and 34 in May. The median date on which 100 birds were observed was May 8.

AUTUMN MIGRATION

The western form of the Palm Warbler begins migration in the fall during the latter part of August (Bent, 1953:448; Soper, 1942:80; Godfrey, 1950:71). The main migration in the Canadian provinces occurs in late August and early September. Rand (1944*a*:123) observed two birds at Muskwa, Mile 152J, Alaskan Highway, British Columbia, September 16, 1943. At Junction Lake, Wood Buffalo Park, Alberta, Soper

(1942:80) observed small active bands in southerly migration on September 2, 1933, a few remaining until September 18. W. Ray Salt (1938:135) reported that between 75 and 100 Palm Warblers were observed, September 7 to 10, 1935, in the Rosebud District, Alberta. Godfrey (1950:71) observed the species at Flotten Lake, Saskatchewan, July 31 to September 6, 1948, but the main migration occurred between August 26 and September 6. At Moosonee, Ontario, Lewis (1939:51) noted a marked southward movement on September 18, 1938, and he and Peters (1941:114) gave the latest date as September 24, as did Hewitt (Manning, 1952:83). Along Lake Superior where the Agawa River enters Agawa Bay, Ontario, Fargo and Van Tyne (1927:8) noted the species regularly from late August to September 12 when 25 were observed. Thomas S. Roberts (1932:243-244) gave the earliest fall record in Minnesota as August 30 (1927, at Frontenac, Goodhue County) and the latest date, November 3 (1898, at Lanesboro, Fillmore County) but the average date fell in late September.

In southern Michigan, Walkinshaw has noted the species between September 5 (1955, in Muskegon County) and October 15 (1945, in Calhoun County). In Muskegon County he observed 61 Palm Warblers on 11 different dates in the fall, the median date being September 18. In Calhoun County, 86 birds were seen on 27 different dates, the median being September 25.

Wood and Tinker (1934:44) gave records for fall departure from Ann Arbor, Michigan, as September 3 (1912, earliest); and October 14 (1923, latest). Eight records fell in September; three in October.

Dendroica p. palmarum is a common migrant through central United States, rarely as far west as Montana (Saunders, 1921:148) and Nebraska, south to Louisiana where it occurs rarely in winter (Lowery, 1955:36). It is infrequent in New England in migration, but crosses the panhandle of West Virginia (Sutton, 1936:89; Haller, 1938:677).

Winter

The eastern form of the Palm Warbler migrates from the northeastern United States and eastern Canada southwestward, wintering rarely in peninsular Florida but moderately in northwestern Florida (Howell, 1932:410) occasionally to the Keys, then westward along the Gulf States to Louisiana. Birds of the western subspecies cross this migration route enroute to and from peninsular Florida, the Bahamas and the West Indies. While on the Kissimmee Prairie from March 20 to 28, 1938, Walkinshaw observed from one to six Palm Warblers daily. Green *et al.* (1945:60) stated that the nominate race occurred commonly in southern Georgia in winter, and the *D. p. hypochrysea*, all over the state.

The western race of the Palm Warbler has been observed and collected in Bermuda (Griscom, 1937:543-544; Bent, 1953:449), at sea almost 200 miles in the North Atlantic (Scholander, 1955:228), regularly in the Bahamas (Bent; Vaurie, 1953:47; Mayr, 1953:500), in Cuba, "The commonest bird in Cuba . . ." (Barbour, 1943:115), south and east to the Virgin Islands, Puerto Rico and west to Providence Island, Honduras, and Yucatan (Bent). Northward it winters regularly to central Louisiana, Alabama, and South Carolina.

In March, 1945, Walkinshaw observed the species at the airport at Havana, Cuba, on arrival, and then commonly on the Isle of Pines, counting 98 birds (2 to 18 daily) March 13-23 (Walkinshaw and Baker, 1946:140-141).

Breeding Distribution

Although the Palm Warbler is of widespread occurrence in southern Canada, its breeding distribution in the northern United States is irregular (Fig. 1). Records for Minnesota were summarized by Roberts (1932:244–245), and W. J. Breckenridge stated (letter, 1956) that he knew of no additional ones. (Nests reported from Minnesota are listed in Table 1, and further discussion is presented under the topic, Nesting Habitats.)

Fig. 1. Localities of record for *Dendroica p. palmarum* in the United States during the breeding season.

Kumlien and Hollister (1903) stated there was no evidence that this species was a summer resident in Wisconsin. Two decades later, Wallace B. Grange (1924:160) found it in northern Rusk County in June and July, 1923, and observed the birds carrying food on July 8, 1923. Francis Zirrer (Feeney, 1942:84; Bent, 1953:440) stated that the Palm Warbler bred at Hayward, Sawyer County, Wisconsin. Zirrer (letter, November 27, 1955) wrote that the species was a fairly common summer resident in northwestern Sawyer and Rusk counties and northeastern Washburn County.

The accounts that follow will outline our present knowledge of the status of the Palm Warbler as a breeding bird in Michigan.

Lower Peninsula of Michigan.—On June 16, 1931, Richard E. Olsen, Humphrey A. Olsen, Mr. and Mrs. N. T. Peterson and Walkinshaw went to Lovells, Crawford County, Michigan, hoping to photograph and study Kirt-

land's Warbler (*Dendroica kirtlandii*). They had found a newly completed nest there on May 31. Although this nest was deserted, two males were heard singing and a search for nests began immediately. During the afternoon, Mr. Peterson called that a Palm Warbler was scolding him. The Olsens and Walkinshaw rushed over and soon found the female with three stubby-tailed young that must have just left the nest. The nest was not found but the young were photographed (Olsen, Olsen and Walkinshaw, 1931:614). The male was heard singing that evening and the next morning from the top of a 35-foot jack pine (*Pinus banksiana*) which stood above the level of the smaller pines where the Kirtland's Warbler was found. Two Palm Warblers were observed on June 17, and one on June 18.

Independent of this group, Leonard Wing (1933:73–74) worked through this same area during June and early July, 1931, taking the first summer specimens of the Palm Warbler for Michigan. Norman A. Wood had taken an immature female (Univ. Mich. Mus. Zool., 61610) at Tobias Harbor, Isle Royal, August 9, 1929, which was probably a migrant. Wing took an adult male (UMMZ, 67489) on June 3; two males on June 15; one male and a juvenal male, July 4 and a female July 5 (all specimens in UMMZ). During the summer he observed 15 adults and six young.

With all of the work done on Kirtland's Warbler in the jack pine area since 1931, apparently no one found another Palm Warbler until 1955. This gap may represent a real absence of the species, although it may have been overlooked due to a similarity of its song to those of several other species, the Pine Warbler (*Dendroica pinus*), Slate-colored Junco (*Junco hyemalis*), and Chipping Sparrow (*Spizella passerina*) nesting nearby.

On June 18, 1955, while searching for Kirtland's Warblers two miles west of Oscoda, Iosco County, Michigan, and one-half to three-quarters of a mile south of the highway, Mark Wolf found a Palm Warbler's nest. This nest had four young about ready to leave and one infertile egg.

Upper Peninsula of Michigan.—Walkinshaw observed a male Palm Warbler which was definitely established on territory during May, 1943, in an extensive sphagnum moss–spruce swamp in Kinross Township, Chippewa County. On June 20, 1954, W. Powell and Betty Cottrille, William A. Dyer, Russell and Vivian Mumford and he observed three Palm Warblers in a small segment of this same area. On June 23 he again found one of these warblers here.

On June 17, 1953, a group of Wilson Ornithological Society members found a singing male Palm Warbler just west of Sleeper Lake (T48N,R10W,Section 33), Luce County. Pettingill (1951:285) reported the species here also.

On June 27, 1954, Walkinshaw found a singing male in another bog about seven miles northwest of Seney, Schoolcraft County.

On June 16, 1954, C. J. Henry, John Bunnell and Walkinshaw were searching for LeConte's Sparrow (*Passerherbulus caudacutus*) on the Seney

National Wildlife Refuge, Schoolcraft County. A little west of M-Pool, near the Driggs River, as they were hiking along a ridge they observed a Palm Warbler only a few feet away. The bird, which was carrying food, scolded and wagged its tail nervously. Separating, they sat down, and in only a short time the female went to the nest, which contained five young ready to leave. Hoping to obtain photographs, a rush trip was made for cameras, and in only a short time the Cottrilles, William Dyer, Eliot Porter and Walkinshaw returned to find the nest empty. After about two hours they caught four of the young and did get some photographs. One specimen was taken (UMMZ, 136633). The young were replaced in the nest and remained there into the night, but left again the next morning. Josselyn Van Tyne and Betty Cottrille collected the nest (UMMZ); it was made of plant culms, grasses, and some ferns, and lined with feathers, including one large feather of the American Bittern (*Botaurus lentiginosus*), and some fine grasses. Both male and female fed the young, usually at intervals of about three or four minutes. During the entire day, while they were there, with the young out of the nest, the male fed two only and the female fed the other two exclusively.

On June 22, 1956, Laurence C. Binford and Walkinshaw found a singing male in Section 35, T46N,R13W, about 2½ miles east of Seney. The next day there were two singing males here and one pair was carrying food. Binford, William A. Dyer and W. Powell Cottrille found a nest with five very alert young (Fig. 2). The nest was made of grasses, lined with fine dead grasses and small feathers. When collected it weighed 5.1 grams and measured 61.4 mm. across and 34 mm. in depth. Between 5:07 and 7:31 p.m. that evening Walkinshaw was photographing the birds at the nest. The female fed the young 14 times, the male six. They always fed the nestlings insects. The next morning all five young were out of the nest. Dyer captured and banded three of them. One was four inches from the nest; another six inches; a third, 40 feet away and three feet up in a black spruce (*Picea mariana*). The first two were hidden in the dead grass which surrounded the small spruce under which the nest was located.

On June 24, 1956, just one-half mile north of the town of Seney (Section 28,T46N,R13W), Schoolcraft County, Walkinshaw found another pair of Palm Warblers feeding four alert young in a nest. This nest was in the same bog in which the one was found the previous day. It was near a dry ridge but in the border of the bog area. The nest, which weighed 7.1 grams, was built of dead grass and lined with fine grasses and many feathers. It was placed in sphagnum on the ground in a tangle of dead grass at the base of an eight-foot jack pine.

Early in the morning of June 25 all four young Palm Warblers were out of the nest. One was 16 feet northwest; another 31 feet southwest; the third 156 feet west-southwest; the fourth, 39 feet west. Three were hidden

FIG. 2. Palm Warbler feeding nestlings 2 miles east of Seney, Michigan, June 23, 1956.

in leatherleaf (*Chamaedaphne*) and dead grass combination; the fourth was sitting on a jack pine branch one foot from the dry ground on the island of thick jack pine (Fig. 3). All the fledglings were captured and banded. The female fed the young regularly, but the male refused to do so while they were being photographed.

In this area Walkinshaw found two other singing males on June 24, 1956, and observed three on July 4, 1956, one of which was carrying food to young out of a nest. These males observed on the latter date were still singing. Two singing males were found here in late June and early July, 1957, and on June 13, 1957, Walkinshaw, William A. Dyer and Dale Zimmerman found a pair feeding at least three young just out of a nest. One of these could not fly and was easily captured.

Palm Warblers were not found in 'colonies' in any Michigan areas, but rather in scattered pairs. In some areas, probably more favorable, more pairs were located than in others where solitary singing males were observed. Thus, the discovery of one pair is no guarantee that others will be found in the vicinity.

FIG. 3. Female Palm Warbler with recently-banded fledgling, one-half mile north of Seney, Michigan, June 25, 1956.

NESTING HABITATS

The eastern form of the Palm Warbler (Tyler, 1953:451) has been found nesting in two types of habitats. It frequents either the sphagnum bogs or the open barrens, building its nest on the ground or, more rarely, on low branches of the small spruce trees.

Very few nests of the western race have been found. It appears that, in addition to the brush-covered Arctic and sub-Arctic barrens, this form also nests in the same two types of habitats used by the eastern race (see Rand,

1944*b*). L. L. Snyder (1953:79) wrote that the western form used two types of habitats in western Ontario: dry forests of jack pine in park-like areas of mature trees or between thick stands of small trees; and the wet, black spruce bogs, usually of an open nature.

In Manitoba, August 1–31, 1936, P. A. Taverner, Ronald W. Smith, and T. E. Randall found *Dendroica palmarum* the commonest warbler at Thicket Portage, where several juveniles and adults were taken. That summer they recorded the species daily, July 18–30, at Ilford, and located a nest with five eggs at Bird in mid-July, but found only two individuals at Herchmer on June 22. Their field notes show that the species was fairly common in second-growth deciduous shrubbery (Godfrey, 1953:3, 39–40).

The Palm Warblers found in Crawford County, Michigan, in June, 1931 (no. 29, Table 1), were in completely dry area covered with Grayling sand, and grown to low-statured jack pines, with clearings and thick stands alternating. The ground cover was of grasses, bearberry (*Arctostaphylos uva-ursi*), blueberry (*Vaccinium*), wintergreen (*Gaultheria procumbens*), and sweet fern (*Myrica asplenifolia*). The area where Wolf found the nest (no. 31) in Iosco County, Michigan, was very similar to this Crawford County area. That nest was placed on the ground at the base of a jack pine.

The nest found on the Seney National Wildlife Refuge on June 16, 1955 (no. 25), was placed on a dry ridge completely surrounded by muskeg. The ridge was grown to a thin, wiry grass, some wintergreen and blueberry and a few dead bracken ferns (*Pteridium*). On the ridge were several jack pines ranging in height from 15 to 25 feet. Several yards to the south was an extensive sphagnum moss–leatherleaf bog similar to that just east of Seney. There were extensive areas of leatherleaf where no trees were located at all. Other portions of the bog were surrounded by black spruce in thick, dense stands. In a partial clearing of one of these stands of spruce, Binford, Dyer, and Cottrille found their 1956 nest (no. 26). It was situated at the base of a 4½-foot black spruce, sunken to the rim in sphagnum moss (Fig. 4). Dead grass, fine sedges, leatherleaf, Labrador tea (*Ledum groenlandicum*), swamp laurel (*Kalmia polifolia*), and rosemary (*Andromeda*) were found in the vicinity. On the dry ridges *Lycopodium*, trailing arbutus (*Epigaea repens*) and wintergreen were found. The second nest found in 1956 (no. 27) was situated in the sphagnum at the base of an eight-foot jack pine, surrounded by dead grass and sedges growing along the leatherleaf border. There were some tamaracks (*Larix laricina*) and orchids scattered through the bog also.

Francis Zirrer (W. S. Feeney, 1942:84; Bent, 1953:440) stated that in Wisconsin the Palm Warbler bred at Hayward, Sawyer County, in cedar (*Thuja occidentalis*)–tamarack–spruce bogs. Zirrer (letter, November 27, 1955) wrote: "This species is a fairly common summer resident in suitable bogs." He never found the species in thick bog forests or in treeless bog areas. It preferred situations where trees, such as tamarack, black spruce, white cedar and balsam (*Abies balsamea*), both large and small, in groups and singly, alternated with open sphagnum and bog shrubbery. The Palm Warbler rarely was found far from the rim of the bog. The nest (no. 24) Zirrer discovered on May 20, 1949, was sunken into sphagnum under the drooping boughs of a small black spruce, next to the bole of an uprooted tamarack of about 10 inches in diameter. It was made of dry swamp grass, and greenish-gray lichens from the tamarack bole, and was lined with feathers from a dead Barred Owl (*Strix varia*) found nearby.

In Minnesota, Dr. Roberts (1932:244) stated that the Palm Warbler was found in spruce–tamarack bogs, where the nests were sunken to the rim in sphagnum hummocks and surrounded by small, shrubby plants, but open from above. The nests in Minnesota (nos. 20–21) were made of coarse grass and roots, lined with fine grass and rootlets.

TABLE 1

NESTS OF THE WESTERN PALM WARBLER

No.	Locality	Date	Breeding Record[1]	Observer	Published Record or Specimen
1.	ONTARIO, Moosonee, Cochrane District, 51°N., 80.5°W.	July 11, 1939	Nest, 5 eggs	T. M. Shortt	(Royal Ontario Mus. Zool.)
2.	ONTARIO, Moosonee, Cochrane District	July 17, 1939	Nest, 4 young	T. M. Shortt	(ROMZ)
3.	ONTARIO, Cochrane District, McMillan Twp.	June 7, 1952	Nest, 5 eggs	Clifford Hope	(ROMZ)
4.	ONTARIO, Thunder Bay District, Port Arthur, 48.5°N., 89.5°W.	June 19, 1945	Nest, 4 eggs	L. S. Dear	(ROMZ)
5.	MANITOBA, Lake of the Woods, 95°+ W.	Summer, 1920	1 juv., 1 female taken	Wm. Rowan	(1922:232 and letter)
6.	MANITOBA, Bird, 56.5°N., 94°W.	July 3–17, 1936	Nest, 5 eggs	P. A. Taverner R. W. Smith T. E. Randall	(Godfrey, 1953: 3, 39, 40)
7.	MANITOBA, Vivian, 49.9°N., 96°W.	July 12, 1932	Nest, 4 young	T. M. Shortt	(ROMZ)
8.	SASKATCHEWAN, Jeanette Lake, 54.5°N., 108°W.	August 2, 1948	1 juv., 1 female taken	W. E. Godfrey	(1950:71)
9.	SASKATCHEWAN, Birch Lake near Roddick, 53°N. 106.25°W.	June 10, 1927	Nest, 5 eggs	H. H. Mitchell	(Saskatchewan Mus. Nat. Hist.)
10.	ALBERTA, Belvedere, 54°N., 114.7°W.	June 12, 1923	Nest, 5 eggs	R. C. Harlow	(Bent, 1953: 441)
11.	ALBERTA, Belvedere, 54°N., 114.7°W.	June 11, 1924	Nest, 5 eggs	Dick Rauch	(Bent, 1953: 441)
12.	ALBERTA, Belvedere, 54°N., 114.7°W.	June 16, 1924	Nest, 5 eggs	R. C. Harlow	(Bent, 1953: 441)
13.	ALBERTA, Grasslands, 54.9°N., 112.8°W.	May 23, 1933	Nest, 5 eggs	T. E. Randall	(Bent, 1953: 441)
14.	ALBERTA, Fawcett, 54°N., 112.8°W.	year ?	Nest, eggs	Wm. Rowan	(Letter, 1957)
15.	ALBERTA, Fawcett, 54°N., 112.8°W.	May 25, 1942	Nest, 5 eggs	L. H. Walkinshaw	(Baker and Walkinshaw, 1946:9)

16. ALBERTA, Chipewyan, 59°N., 111°W.	July 2, 1945	Nest, 4 eggs	T. M. Shortt	(letter)
17. BRITISH COLUMBIA, Trutch, 57.5°N., 123°W.	July 13, 1943	Adult feeding young	A. L. Rand	(1944*a*:123)
18. NORTHWEST TERRITORIES, Fort Resolution, Dist. of Mackenzie, 61°N., 113.5°W.	June 18, (year?)	Nest, 5 young	Kennicott	(Ridgway, 1889:155)
19. MINNESOTA, Marshall Co., Moose River, Mud Lake, 48°N., 96°W.	July 16–18, 1900	Three juveniles	Thomas S. Roberts	(1932:244)
20. MINNESOTA, Hibbing, 47.5°N., 93°W.	June 13, 1906	Nest, 4 young	H. F. Kendall	(Roberts, 1932:244)
21. MINNESOTA, Aitkin Co., 47°N., 93°W.	June 14, 1929	Nest, 1 egg, 3 young	N. L. Huff	(Roberts, 1932:244)
22. MINNESOTA, Cass Lake, 47.5°N., 94.5°W.	July, 1916	Adults, 2 young	L. L. Lofstrom Richardson	(Roberts, 1932:244)
23. WISCONSIN, Rusk Co., 46°N., 91°W.	July 8, 1923	Adults carrying food	Wallace Grange	(1924:160)
24. WISCONSIN, Sawyer Co., Hayward, 46°N., 91.5°W.	May 20, 1949	Nest, 3 eggs	Francis Zirrer	(letter)
25. MICHIGAN, Schoolcraft Co., Seney Natl. Wildlife Refuge, 46°N., 86°W.	June 16, 1955	Nest, 5 young	John Bunnell C. J. Henry L. H. Walkinshaw	(Nest, 1 juvenile UMMZ)
26. MICHIGAN, Schoolcraft Co., Seney, 2 mi. E.	June 23, 1956	Nest, 5 young	L. C. Binford W. P. Cottrille Wm. A. Dyer	(Nest UMMZ)
27. MICHIGAN, Schoolcraft Co., Seney, ½ mi. N.	June 24, 1956	Nest, 4 young	L. H. Walkinshaw	
28. MICHIGAN, Schoolcraft Co., Seney, ½ mi. N.	June 13, 1957	Three juveniles with parents	Wm. A. Dyer D. A. Zimmerman L. H. Walkinshaw	
29. MICHIGAN, Crawford Co., Lovells, 2½ mi. S. 44°N., 84°W.	June 16, 1931	Three juveniles with parents	H. A. Olsen R. E. Olsen N. T. Peterson L. H. Walkinshaw	(Olsen, Olsen, and Walkinshaw 1931:614)
30. MICHIGAN, Crawford Co., Lovells, 2½ mi. S.	July 4, 1931	Juvenile spec.	L. W. Wing	(1933:74) (UMMZ)
31. MICHIGAN, Iosco Co., Oscoda, 2 mi. W. 44°N., 83°W.	June 18, 1955	Nest, 4 young, 1 infertile egg	Mark Wolf	(personal communication)

[1]Nestsites are referred to by number in section on Nesting Habitats.

One nest contained many feathers.

At Fawcett, Alberta, between the Pembina and Athabasca rivers, Walkinshaw found a nest with five eggs on May 25, 1942 (no. 15). This area was quite open, predominantly muskeg, surrounded by forests of black spruce and tamarack, with ridges covered with jack pine. In an area of drier muskeg, not far from a ridge, he flushed the female from her nest. It was an open location with a few small dwarf birch (*Betula*) growing in close proximity. The nest was beneath one of these little birches in dead grass on a sphagnum hummock. It was made of fine grass, lined with finer grasses, feathers, and fine rootlets. It measured 80 mm. across outside, 50 mm. across inside and 42 mm. deep.

FIG. 4. Nestsite of Palm Warbler at base of black spruce (*Picea mariana*), 2 miles east of Seney, Michigan, June 23, 1956.

The area near Belvedere, Alberta, worked by Richard C. Harlow, Dick Rauch and A. D. Henderson (Bent, 1953:441) was dry muskeg and the nests (nos. 10–12) were found in sphagnum moss among scattered spruces and tamaracks. One nest was concealed at the base of a spruce seedling under a clump of dry grass growing near the top of a large hummock of sphagnum. Another was constructed of plant fibers, fine dry grasses, and fine bark shreds, and was lined with feathers of the Ruffed Grouse (*Bonasa umbellus*).

W. Earl Godfrey (1950:71) found the Palm Warbler at Flotten Lake, Saskatchewan, where it was not uncommon in summer in the alder (*Alnus*) and willow (*Salix*) bogs, and at the water edges. At Fishing Lake, Saskatchewan, Walkinshaw found a singing

male on June 11, 1947, in a clearing near the border of a black spruce swamp. Kennicott (Ridgway, 1889:155) found the Palm Warbler's nest (no. 18) at Fort Resolution, on the ground in a swamp, on a hummock, at the foot of a small spruce tree.

The nest (no. 7) found by T. M. Shortt at Vivian, Manitoba, was in a sphagnum moss hummock at the edge of a black spruce-tamarack swamp. The nest (no. 1) Shortt found at Moosonee, Ontario, July 11, 1939, was on the ground in sphagnum moss amid dwarf birch and Labrador tea in a treeless muskeg. The nest (no. 2) he found in the same area July 17, 1939, was also on a sphagnum hummock in open muskeg of dwarf birch, Labrador tea and a few scattered tamaracks. The nest (no. 16) he found at Chipewyan, Alberta, was in sphagnum at the edge of black spruce.

Thus, we see that the occurrence of *Dendroica p. palmarum* in the breeding season in Michigan and adjacent states is explicable on the basis of nesting habitats which are found consistent with those chosen by this warbler in the more northern portions of its range.

Summary

The western race of the Palm Warbler nests in coniferous woodland areas of southern Canada and adjacent portions of Minnesota, Wisconsin, and Michigan, and it is known only as a migrant or winter visitant in most of the eastern United States. Details concerning the first reported nestings in Michigan are presented, and breeding habitats discussed.

Descriptive data for 31 nesting records of *Dendroica p. palmarum* are listed. Nesting areas used seem to be of two types. One is on dry plains grown to small jack pines, with clearings and a ground cover of low, spreading shrubs, such as bearberry, blueberry, wintergreen, trailing arbutus, and sweet fern. The Palm Warbler prefers such dry areas in the northern part of the lower peninsula of Michigan (the same habitat occupied by Kirtland's Warbler), and was found on similar dry ridges in spruce swamps in the northern peninsula. All nests were built in semi-open areas where the spruce and jack pine were neither too tall nor too dense, and where clearings were interspersed with patches of denser growth. The other type of nesting habitat was along the borders of spruce bogs, where clearings were grown sparingly to small black spruces, and the ground covered with sphagnum moss, leatherleaf, Labrador tea, *Andromeda*, and *Kalmia polifolia*. In northern Ontario and the treeless areas of the arctic slope of Canada, the species is found in second-growth deciduous shrubbery on the tundra. There, dwarf birch often is the predominant shrub.

With what meagre information is available, it appears that the Palm Warbler prefers to nest on the ground at the base of a small tree or shrub. Small spruces, jack pines or tamaracks are the favorite trees in Michigan; bracken fern was also used, whereas two nests from farther north were at the bases of small dwarf birches.

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FALL MIGRATION AND WEATHER, WITH SPECIAL REFERENCE TO HARRIS' SPARROW

BY O. A. STEVENS

Discussion of weather in relation to migration has usually pertained to the spring season. There are several reasons why fall migration should receive more attention. Systematic trapping and banding on a large scale have resulted in the accumulation of many new data. From 1926 to 1955 I banded approximately 7,000 Harris' Sparrows (*Zonotrichia querula*), about 80 per cent of them in the fall. This species has a narrow migration path, is easily trapped and seems well suited for such study. Harkins (1937) concluded that these birds do follow the same routes and stop at the same places, but he was working within the winter range where movements are limited. The only station return that I have had was a bird banded October 13, 1953, and recaptured October 1, 1955. No birds banded at other stations have been caught by me, but one banded here on September 16, 1937, was caught at Aberdeen, South Dakota, May 4, 1940.

In the spring, Harris' Sparrows reach Fargo, North Dakota, about May 7 (Stevens, 1950) and are present about two weeks. It seems evident that both their arrival and length of stay are delayed by cold weather, and that their departure is hastened by a warm wave. They are restless and there are few repeat records of individual birds. In the fall they appear about September 20 and are common for about four weeks. From 1927 to 1940 large numbers were trapped (Table 1). Fewer were taken from 1941 to 1951, but there were more again in 1952 when 52 of 210 individuals (25.2 per cent) registered repeat records.

Figure 1 shows the fall migration of Harris' and White-throated sparrows (*Zonotrichia albicollis*) based upon numbers of birds banded over a period of 14 years. For an individual year there are alternating highs and lows in numbers (Fig. 4) and, since these occur on different days in different years, an actual daily average would give a relatively flat curve.

Use of Trapping Data

The significance of the numbers caught in any one day may be questioned, but in the main I feel that the total captured corresponds to the numbers present. Large numbers trapped indicate influxes of birds and vice versa. In the spring an influx often represents a check in migration due to unfavorable weather. The often-observed "warbler waves," when correlated with high temperatures, suggest that an influx may also be a normal rest period. In the fall we might expect accumulations during favorable weather but it seems more likely that the peaks represent either minor local movement or normal

rest periods. The frequent reappearance of individuals after an absence of several days is indicative of local population shifts.

I had noted (Stevens, 1930) that regular trapping operations contribute to general information because of the frequent visits to traps. Workers not engaged in trapping have questioned that numbers trapped are as reliable an index as those obtained from sight records. I feel that trapping records are useful for species that can be taken readily. They have seemed to me

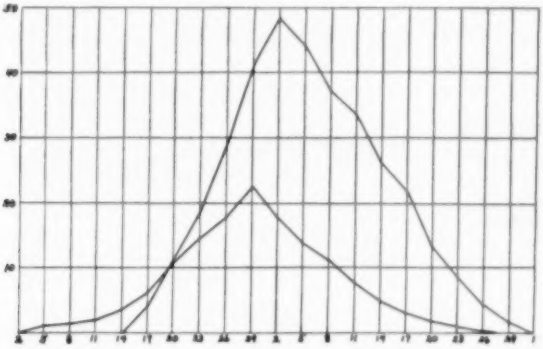

FIG. 1. Fall migration of Harris' (upper line) and White-throated sparrows at Fargo, North Dakota. The numbers are totals for three-day periods using a running average of five days for each day of the months of September and October from 1927 to 1940 inclusive.

TABLE 1

REPEAT RECORDS OF HARRIS' SPARROW AT FARGO, NORTH DAKOTA, IN RELATION TO OCTOBER TEMPERATURE

Year	Number banded	Per cent repeating	Avg. days stay	October Temperatures Mean, °F.	Departure from normal
1927	165	38.7	7.5	48	+3
1928	412	51.9	7.5	46	+1
1929	248	38.3	4.7	48	+3
1930	361	47.4	6.3	44	—1
1931	273	46.2	5.7	50	+5
1932	478	47.7	6.0	41	—4
1933	436	53.7	5.8	43	—2
1934	287	27.2	4.3	50	+5
1935	337	41.8	7.6	44	—1
1936	186	38.8	4.5	42	—3
1937	392	31.6	7.1	44	—1
1938	204	19.6	7.4	52	+7
1939	347	20.5	4.7	43	—2
1940	185	36.2	6.1	52	+7

more reliable with *Zonotrichia* than with *Junco*. Banded birds are definitely identified, but unbanded birds re-entering the area could not be distinguished by sight from new arrivals. Certainly trapping reveals some rare species

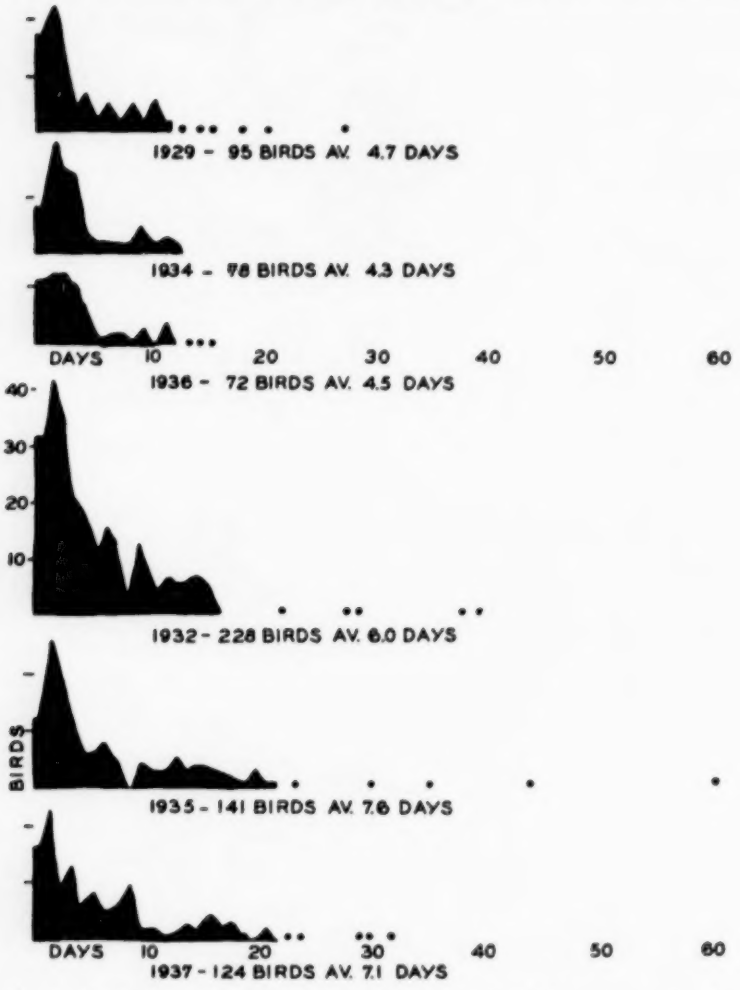

FIG. 2. Number of Harris' Sparrows repeating and length of their stay in autumn for different years. Black areas represent the total number of birds repeating and scattered dots, individual birds.

that would be unlikely to be seen on field trips. Usually only a small area is sampled by the traps and some species will be missed unless special efforts are made to secure them.

Weather Patterns and Numbers Trapped

Necessary absence of the operator and unfavorable weather at times interrupt trapping. In 1938 the weather was unusually warm and there were no interruptions. The number of birds taken (Fig. 3) shows a pronounced double peak unusually late in the season. More often there is a peak about September 25 to 30 and a second about October 15.

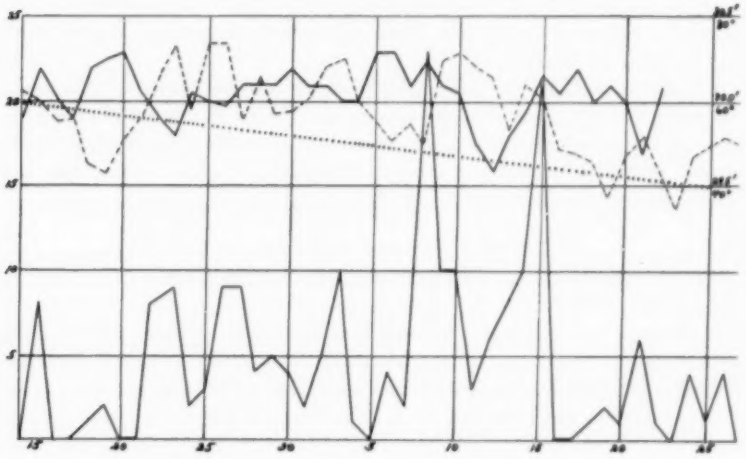

Fig. 3. Number of Harris' Sparrows banded in 1938 (lower line). Solid line above is barometric pressure at 7:00 a.m.; broken line, mean temperature in °F; dotted line, normal mean daily temperature.

It might be argued that the data for 1938 (Fig. 3) show the effects of warm weather in the late peak of birds. The weather of 1952 was similar to that of 1938 but the curve for birds banded was quite different. The largest numbers were taken on September 19 and 20. There were no well-marked fluctuations through October and very few Harris' Sparrows were taken after October 15.

The largest numbers were taken in 1952 on September 19 and 20. This was during a cool period. The temperature began falling from the 16th and remained below normal until the 23rd. There was a pronounced drop in birds on the 21st followed by a recovery for the next three days and then another drop for two days. A warm wave from September 25 to 30 showed little

effect nor did another cool wave, October 1 to 7. The next cold wave on October 13 to 16 coincided with the end of the main migration.

It is often suggested that birds are detained longer by the feeding that accompanies banding operations but after many years of study I feel that very few individuals are so affected (see Fig. 2). For example, in October, 1952, very few repeats occurred, although the weather continued unusually mild. Other causes may be responsible for the persistent repeats. Occasionally a bird trapped frequently is found to be ill. Since 1932 I have used water traps almost entirely because they capture nearly all species. This method would eliminate the feeding factor, and dry, warm weather seems not to have an obvious effect on numbers taken by water traps. Unavoidable changes in cover and in natural feeding areas beyond the traps from year to year probably are more important.

In 1936, with about the same number of birds as in 1938, twice as many repeated. The distribution of the repeats was similar to that of 1938 but the average length of stay was much shorter. The banding pattern was fairly normal (Fig. 4), and not well related to temperature, which was average but with wide fluctuations.

Significance of Repeat Records at Traps

For the present purpose repeat records are of much interest. I have reported (Swenk and Stevens, 1929) that, as judged from repeat records, the average stopover of Harris' Sparrows in this latitude is about a week. Later record indicate that it has varied appreciably from year to year. There seems a tendency toward a larger proportion of repeats when birds are more abundant (Table 1), but little relation between length of stay, or mean October temperature and number repeating. The length of time over which individual birds repeated is shown in Figure 2 for three each of the longer and shorter averages. In calculating repeats, birds that were recaptured only the same day as banded are counted as one day.

These conclusions are based upon general observations and the day-to-day log of birds caught. In 1952, eight birds were taken on September 15 and 16. All but one of these repeated one or more times over periods of from one to 10 days (extreme 24 days). Since these were the first of the species taken we could surmise they had traveled some distance and were due for a rest period. On September 17 and 18 eight more birds were banded but none of these repeated. Of 21 banded on September 19, only five repeated, four on September 27 and one October 12. Of 14 banded on September 20, three repeated once in the next day of two, but three others and eight of 11 banded on September 21 repeated several times until the end of the month. Of the next nine only two repeated, but again all but one of the last four on September 23 and the first five on the 24th repeated over several days. After

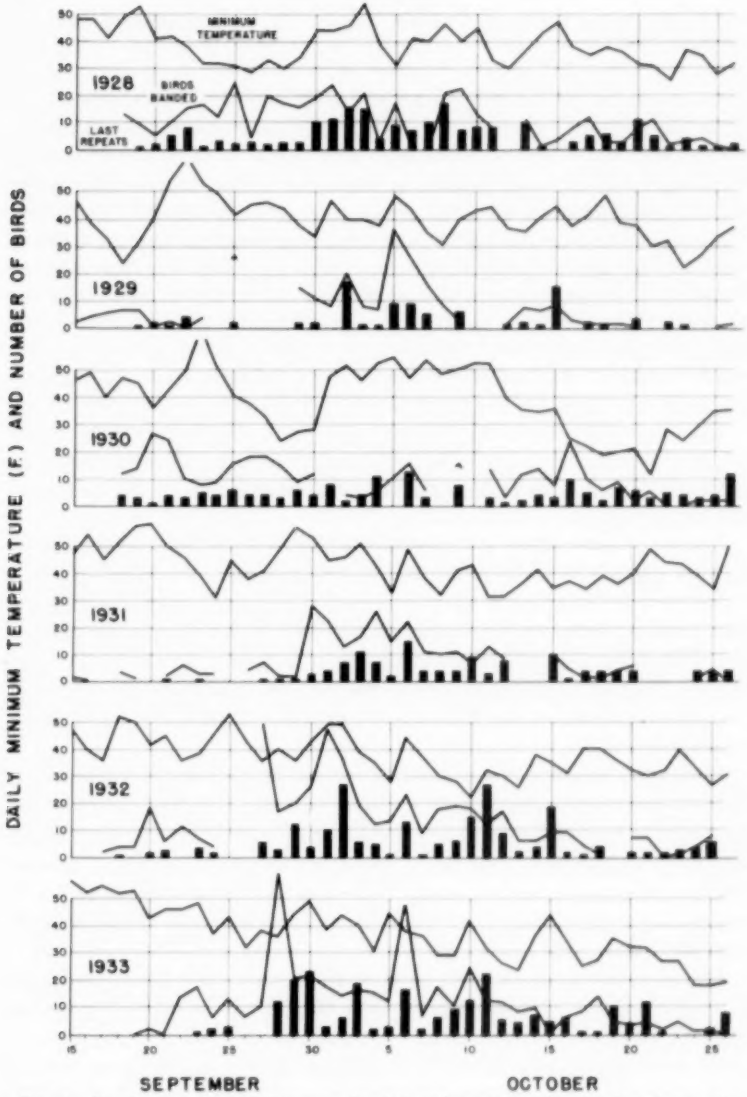

FIG. 4. Numbers of Harris' Sparrows banded and repeating for the last time; also minimum temperatures, 1928–33. Lower line, birds banded (trapping interrupted where broken); bars, birds repeating for the last time; upper line, minimum temperature in °F.

September 24 there were few repeats except for four of 10 birds banded October 4.

Weather Patterns and Autumn Departures

The dates of departure from a given locality should show whether or not the weather is a major factor. When large numbers of birds have been banded and many have been retaken daily, we have good evidence of departure dates.

On the night of October 3, 1938, we saw a marked departure of all species. The wind shifted from southeast to northwest and a decided drop in maximum but not in minimum temperature followed. The largest number of Harris' Sparrows was taken October 15, when the wind was again from the *southeast*. They seemed to move on at once though the wind remained in the south and the temperature was relatively high. Notwithstanding the mild weather and lack of storms in 1938, the numbers of birds taken and numbers repeating were small but the length of stay was long.

An interesting point is the frequent observation that birds will be scarce the day the weather turns warmer, apparently having moved southward with the beginning of a south wind, rather than the day or two before during the cool period.

For the present study the departure of birds from the vicinity should indicate the time at which southward flights are begun. When the last dates on which individual Harris' Sparrows repeated in the fall of 1952 are plotted, they form as nearly a normal curve as one could expect from a limited number. The only well marked depressions are on September 25 and 28. A slight drop in temperature on September 25 was followed immediately by the greatest rise of temperature for the season. September 28 showed only a slight, temporary decrease in temperature.

Dates of pronounced arrivals and departures for the trapping periods from 1928 to 1940 were compared with weather changes. Marked increases and decreases of birds were associated about equally with either rising or falling temperatures and also with either rising or falling barometric pressures. Decided changes in numbers were most often associated with north winds, but nearly as frequently with winds from the south, less frequently with west and rarely with east winds.

Minimum temperatures might be expected to govern fall flights. In Figure 4 these are shown with numbers of birds banded and repeating for the last time on each day, 1928 to 1933. The data for October 3, 1928, seem to show heavy departure with a drop in temperature but departures on October 8 were on rising temperature. Similar cases appear on October 3 and 15, 1929, and October 2 and 11, 1932. Four departure dates in 1933 coincide with temperature drops.

Summary

About 7,000 Harris' Sparrow were banded at Fargo, North Dakota, from 1926 to 1955, four-fifths of them during fall migration. They arrive at Fargo about September 15 and are abundant until October 14 to 20, reaching the peak about October 2. Only one return record has been secured during this period and no birds banded at other stations have been taken. Many individuals remain in the vicinity for several (usually five to seven) days, occasionally as much as a month. Birds banded on certain days frequently seem to remain in the area while those taken on other days do not repeat.

The number of birds taken each day was examined for peak records, as were the departure dates of individuals that were re-trapped. Southward flights seemed to follow the calendar and were not well correlated with weather fluctuations. Departures are commonly noted with the beginning of a rise in temperature and beginning of a south wind. Continued warm weather did not delay departures.

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North Dakota Agricultural College, Fargo, North Dakota, August 20, 1957

GENERAL NOTES

Eastern Phoebe nesting in Louisiana.—In writing of the Eastern Phoebe (*Sayornis phoebe*) in Louisiana during the summer, Oberholser (1938. "The Bird Life of Louisiana," p. 394) states: "The only summer records for Louisiana are two birds seen northeast of Tallulah, between June 13 and July 13, 1924, by E. R. Kalmbach; and one seen at Logansport, by A. H. Howell, between August 25 and 27, 1906." No additional summer records in Louisiana since those cited by Oberholser have been reported. Alvin R. Cahn (1921. *Wilson Bull.*, 33:174) considered the Eastern Phoebe to be a "common breeding species about Marshall," Harrison County, Texas, in 1920. W. J. Baerg (1951. "The Birds of Arkansas," p. 97) states: "In the southern half of Arkansas it is a common resident species;" however, he gives no details. Ben B. Coffey, Jr. (1952. Personal communication) considers the Eastern Phoebe a rare summer resident at Memphis, Tennessee; he has found it nesting also in northern Mississippi (Newman, 1956. *Audubon Field Notes*, 10(5):389).

On April 18, 1954, James R. Stewart, Jr., and I observed an Eastern Phoebe in song near a small culvert at Metcalf, Caddo Parish, Louisiana. It disappeared shortly thereafter. Since we had been unable to locate a nest, the bird was considered to be a late migrant. The possibility that the species might occur as a breeding bird in the area was not entirely dismissed, however, for on the following weekend Stewart discovered a mud structure, which had the shape of a nest, beneath a bridge located 0.6 miles northeast of the point where we had observed the singing bird. Several visits to this bridge established that the nest, if such it was, was not in use, for no phoebes were seen or heard in the vicinity.

On May 28, 1955, I observed an Eastern Phoebe at a point about 7.5 miles north of Shreveport, Caddo Parish, Louisiana. I had been visiting this area regularly earlier in the month without having seen this species; I returned on May 29, but the phoebe could not be found. This individual was silent during my visit to the area on May 28; it had obscure brownish wingbars. The bird was believed to be a very late migrant, and was so recorded by Newman (1955. *Audubon Field Notes*, 9(4):337). The possibility is now presented that this may have been a wandering bird of the year. However, an extensive investigation of bridges and culverts in the northern half of Caddo Parish had been made on May 7; although the search was primarily for Barn Swallows, no phoebes were observed in that area.

On June 10, 1956, I observed two Eastern Phoebes perched together on a fence by a small bridge 1.1 miles west of Four Forks, in extreme southwestern Caddo Parish. Investigating, I found a nest on a beam on the underside of the bridge, over a small creek. After I had returned from underneath the bridge, I saw one of the phoebes fly under the bridge and not reappear. I went back and looked at the nest; the bird was settled on the nest but flew when it saw me. The site of these observations is only 2.5 miles east of the Texas state line; it is 14 miles southwest of Metcalf, and about 17 miles north of Logansport, DeSoto Parish. On June 23 this nest held three nestlings which were several days old. Both adults were watched as they carried food to the young. G. Dale Hamilton obtained color photographs of the adults with food at the nest. The adults were usually silent but would call when Hamilton or I was near the nest. The presumed male sang briefly on one occasion while holding food. Two other phoebes were seen on June 23, about 120 yards south of the nest site; at least one had brownish wingbars. Whether these individuals were another breeding pair or were young of an earlier nesting is unknown; there was no sign of an old nest under the bridge. I paid a brief visit to the area on July 2.

The nest was empty; an adult and a fledged juvenile were observed feeding about 25 yards north of the bridge. My next visit to the area was made on August 4 with Stewart; we were unable to locate any phoebes.

There were several other small bridges in the southwestern part of Caddo Parish, all within about six miles of this nest site, which were visited after the discovery of this breeding pair. No phoebes were observed at any of these bridges. A possible explanation is that the bridge which was used differed from the other bridges in that access to the underside was not partially obstructed by nearby grass or shrubbery.—Horace H. Jeter, *4534 Fairfield Avenue, Shreveport, Louisiana, December 27, 1956.*

Comments on wing-flashing and its occurrence in Mimidae with uniformly colored wings.—At least two species of mockingbirds without wing patches are known to flash their wings in the manner characteristic of the Common Mockingbird (*Mimus polyglottos*). Halle (1948. *Wilson Bull.*, 60: 243) noted the behavior in the Calandria Mockingbird (*M. saturninus*) in Argentina, and Haverschmidt (1953. *Wilson Bull.*, 65: 52) in the Graceful Mockingbird (*M. gilvus*) in Surinam.

My own observation on this last species on July 24, 1956, near San Cristobal de Las Casas, Chiapas, Mexico, where the resident race is *M. gilvus gracilis*, parallels Haverschmidt's. While studying birds with Mrs. Edna W. Miner along the Rio Amarillo in the vicinity of the Sumidero, I saw one of several Graceful Mockingbirds repeatedly flash its wings with the same jerky movements used by *polyglottos* in my yard in Oklahoma. This individual, foraging over an area of heavily grazed pasture grass, stopped now and then to flash its wings. It seemed to me that movements of its blackish wings against the light gray body were only a little less arresting than the flickering of white wing patches in the Common Mockingbird.

Halle suggested that the performance by mockingbirds with uniformly colored wings would seem to deal a blow to the theory of wing-patch display. The same might be said of wing-flashing in the Brown Thrasher (*Toxostoma rufum*).

Mrs. Amelia Laskey's brief comment on an adult Brown Thrasher "opening and closing its wings while investigating something in a dark spot at the base of a yucca plant where it had been feeding" has already been reported by Sutton (1946. *Wilson Bull.*, 58: 206–209). The fuller accounts for this species given by Ruth Thomas (1952. "Crip, Come Home." pp. 55, 140–141) also bear further mention.

Mrs. Thomas watched four young Brown Thrashers, about 30 days out of the nest, attack a mouse. One of them "pecked at it, at the same time lifting and spreading his wings." Of an adult female attacking a dead snake, Mrs. Thomas wrote: "First walking up and down beside its sprawled length, she raised and spread her wings, and every few steps jumped in for a quick peck. She grew bolder and for a few seconds stabbed in fury, then resumed the wary walk and the deliberate wing-lifting . . ." When another adult female "flew down and spread her wings at the snake," it was driven off by the first thrasher.

The inference is strong that all these Brown Thrashers were performing in the same way as Common Mockingbirds, although the observers have not expressly termed it wing-flashing. Tomkins (1950. *Wilson Bull.*, 62: 41–42), however, definitely ascribes wing-flashing to this species but without fully describing the action. The foregoing items, together with others in the *Wilson Bulletin* (Gander, 43, 1931: 146; Allen, 59, 1947: 71–73; Wampole, 61, 1949: 113; Brackbill, 63, 1951: 204–206), furnish considerable discussion of function, motivation and the age-sex factors in wing-flashing. More-

over, they also show that there is some confusion as to what constitutes wing-flashing, even in *M. polyglottos*.

Until we arrive at a clear understanding of, and a more definitive name for, this special wing display of certain mockingbirds, the term *wing-flashing* becomes ambiguous when used without descriptive details. Thus one wonders whether the Mockingbird that used wing-flashing many times during its half-hour attack on a blacksnake was performing the very same motions seen in the foraging bird (Hicks, 1955. *Auk*, 72: 296–297). If certain wing movements of the Least Bittern (*Ixobrychus exilis*) while stalking its prey, and Roadrunner (*Geococcyx californianus*) while hunting grasshoppers (Sutton, *op. cit.*) are to be equated with the Common Mockingbird's formalized and precisely repeated wing action as it works its way across a lawn, then it would seem that certain of the African herons while fishing (Austin L. Rand. 1955. "Stray Feathers from a Bird Man's Desk," pp. 131–132), the Jacana (*Jacana spinosa*) in sexual display (Rand, 1954. *Wilson Bull.*, 66: 131), and many another species might be said to wing-flash.

Dilger (1956. *Auk*, 73: 325), for instance, designates as "Wing Flashing" both the single wing and the double wing displays that certain thrushes (*Catharus* and *Hylocichla*) make toward an opponent bird. Such displays, he found, were typically preludes to fleeing action by the performer. What, then, of balancing and comforting movements of the wings or the pronounced wing-flicking in such birds as Ruby-crowned Kinglets (*Regulus calendula*) and the redstarts (*Setophaga ruticilla* and *S. picta*)? Where should we draw the line?

Skutch (1950. *Condor*, 52: 225) evidently did not consider that the reactions of a Blue Mockingbird (*Melanotis hypoleucus*), again a plain-winged species, to a handkerchief, placed over its nest and young as an experiment, involved wing-flashing. After pulling on the cloth and causing it to fall to the ground, the bird "hopped all around it, at times spreading his wings, jerking it and attempting to remove it farther from the nest . . ."

I do not think for one minute that the White-winged Dove (*Zenaida asiatica*) which I flushed from her nest and young was performing wing-flashing when she landed heavily near my feet and, back to me, began walking away with rapid, continued, upright stretching and folding of her wings, angel-fashion, though the performance suggested nothing so much as "setting-up" exercises. It was plain enough that these were intention movements motivated by attack and escape drives, neither of which drives has been shown clearly to function in wing-flashing of mockingbirds.

The distinguishing feature in wing-flashing of mockingbirds, as I see it, and one that was entirely absent in the case of the White-winged Dove, and apparently also in the above-mentioned thrushes, is the way the wings are extended by degrees and are held momentarily at several positions along the arc of movement. In *Mimus polyglottos*, *M. saturninus* and *M. gilvus*, at least, the wings "open by hitches," so to speak. Roy Bedichek (1947. "Adventures with a Texas Naturalist," p. 202) says of *polyglottos*: "I have counted as many as five notches before the extension was complete."

Very likely this special action also occurs in young birds of the three mockingbird species mentioned above. Certainly it often is seen in young Common Mockingbirds recently out of the nest and in later stages of development (Michener and Michener, 1935. *Condor*, 37: 106; Sutton; Allen; Brackbill; Tomkins). Peyre Gaillard of Atlanta, Georgia, who has given particular attention to this activity in the Common Mockingbird, informs me that he has seen young birds just before venturing out of the nest move their wings in this peculiar way (letter, January 15, 1955). I myself once saw a large, well-feathered young bird stand high in the nest and twice make three slow, in-

cipient "hitches" of its wings while opening them only part way.

Possibly slow-motion pictures might reveal important differences in the wing-flashing of patterned and clear-winged Mimidae, or even in the Common Mockingbird when in feeding and in threat situations. I have not seen wing-flashing described for nestling Brown Thrashers. Any differences between their wing actions and those of nestling Common Mockingbirds might be especially significant.

An observation on *M. polyglottos* in Austin, Texas, in mid-November, 1946, seems worth including here, because of its unusual setting. A luxuriant growth of Moonflower (*Ipomoea Bona-nox*), trellised out a foot from the house and covering an entire wall and windows, was then untouched by frost. As I sat quietly near a window, my attention was caught by a Mockingbird wing-flashing inside the vines, about eight inches from the screen.

With its back squarely to me, the bird was opening and closing its wings with the usual jerky positionings, except that the vines seemed to hamper full extension at times and once almost threw the bird off balance. Apparently searching the foliage, the bird did not move about between flashings but instead turned its head from side to side with deliberation, sometimes peering up and down. Presently it jumped a few inches to a new footing in the vines and flashed the wings again.

This routine was repeated several times, though the bird did not progress over two yards. I noticed the wings were extended more fully as space permitted. Sometimes the movements were a mere "elbowing" in close quarters or extension was uneven when the wing toward the wall had freedom and the other was cramped by the vines. I saw no food taken, no other creature among the leaves. There was, I knew, a large Scaly Tree Lizard (probably *Sceloporus olivaceus*) that frequented the vines; but the bird did not center its attention on any particular spot and its general attitude suggested tranquillity. At no time did the bird seem to be aware of the observer.—Lovie M. Whitaker, *1204 W. Brooks Street, Norman, Oklahoma, January 26, 1957.*

Brood capture involving conflict between two female Mallards.—In April, 1953, a banded female Mallard (*Anas platyrhynchos*), returned to nest on a small artificial marsh near Norwich, Chenango County, New York, where she had been released the previous July. She was one of 10 game farm-reared, six-week old Mallards, equally divided as to sex, that were liberated on the marsh. Her mate wore an unidentified band, but may also have been from the same release.

From her clutch of 12 eggs she brought off only four ducklings on or about May 18. Sometime between late May and June 9, she lost one of the four, but the remaining three survived and were able to fly by the middle of July.

Also on the marsh, an unbanded female Mallard was rearing a brood of 10, hatched about July 1. The second female and her brood regularly remained on the opposite side of the marsh, away from the brood of three.

When the young of the banded female were able to fly she was in flightless condition. Apparently she still had an unusually strong "brood instinct," for she fought the unbanded female for possession of the brood of 10. Actual conflict, initiated by the banded bird, involving extended pursuits that resulted in scattering of the young, was observed on three occasions. By July 25, one week after she was last seen with her original three, the banded female had taken over the brood of 10, and the dispossessed female apparently had been driven from the marsh. Nine of the 10 were reared by the foster-mother. They were observed to fly on September 7, when the banded female was caught. At this late date the bird was still flightless with primary feathers just breaking their sheaths.

During the rearing of the original brood the banded female was accompanied by her mate whenever observed. He assisted in driving off other ducks that ventured too close to the young. When she possessed the new brood he deserted her, but remained with the three young even when they were flushed from the pond. He was comparatively slow in progressing into eclipse plumage but was flightless for only about two weeks. The female, on the other hand, was flightless for an abnormally long time, possibly as long as two months, for she was unable to fly on July 18 and her primaries still were sheathed on September 7.

With regard to brood capture, an interesting case was reported to me by Professor G. A. Swanson, who observed it on his farm near Ithaca, New York, during the summer of 1954. Two pairs of Mallards nested on the farm, the first bringing off a brood of six late in June, and the other a brood of three a few days later. Both were apparently renestings following unsuccessful first attempts. Several times during their first two weeks, the two broods of ducklings were observed on the same pond, and the size difference could readily be ascertained. Sometimes the two ducks fed near each other and the ducklings intermingled, and on a number of occasions when the broods were separated there were five ducklings with one and four with the other. The fourth one clearly had been transferred from its original parent to the second, since the size difference was still noticeable. Still later, the division was six and three again, but one brood consisting of three younger and three older ducklings, indicating that there had been still another transfer. At no time, however, was any fighting noticed between the two females.—Stuart S. Peters, *Department of Conservation, Cornell University, Ithaca, New York, March 1, 1957.*

Observations on Mexican birds.—Field trips made to various parts of Mexico over a period of years have disclosed information concerning various birds which it is thought may be of general interest.

Antiurus maculicaudatus. Pit-Sweet.—This bird, called "Spotted-tailed Nighthawk" by Cory (1918) in the "Catalogue of the Birds of the Americas," was listed under the genus *Caprimulgus* by Friedmann, Griscom and Moore (1950. *Pac. Coast Avif.* no. 29) and called "Spot-tailed Whip-poor-will." However, it has habits so different from typical members of *Caprimulgus* that it would seem to be best to retain the older classification. The use of a common name suggesting the call of the bird not only follows the usual custom for birds of the group but gives a shorter and simpler name. The Pit-Sweet is quite common on the savannahs of the coastal plain in the region of the Veracruz–Tabasco border, and has been heard calling over a wide area from the last week in March to the second week in May during visits in different years. On one visit to the region in June no birds were heard. (I have not been in the area in the fall.) During the day the birds hide in the dense woods. The plain between the mountains and the Gulf of Mexico in southern Veracruz, Tabasco, and Chiapas is marked with a multiplicity of low ridges over much of its area. Supposedly the great amount of rainfall has washed away most of the plant food on these ridges. At any rate they support a growth of low grasses, but only very scattered small shrubs and an occasional clump of dwarf palms. About half way down the slopes a dense growth of trees begins and the trees become larger and taller at the bottom, where there is frequently a small creek or swamp. The birds come out in the evening (about 7:00 p.m.), and fly back and forth over the grassy areas. They fly low over the grass (mostly from two to 10 feet above the ground) calling as they go. At times they alight on a small patch of bare gravel between clumps of grass and at times they perch for a short time on a twig of one

of the small shrubs which are scattered over the grassland. They perch upright on these small branches and sometimes continue to call. A single call is given and, after a short pause, is repeated after the fashion of the "peent" call of the Booming Nighthawk (*Chordeiles minor*). The pitch of the call is even higher than that of the Nighthawk and reaches a maximum frequency of about 7000 cycles per second. The call may be represented as "Pit-Sweet"; it requires about one second of time and is repeated after a pause of slightly over a second. Occasionally there is a momentary speed-up and three calls are given in rapid succession. The quality is almost insect-like and the volume rather thin. At times the bird makes a "display" noise with the wings by beating them three or four times quickly and forcefully, causing a low-pitched "flut-flut-flut" sound as it pursues another of its kind low over the grass.

Caprimulgus ridgwayi. Whip-poor-will; Cookacheea.—Like other members of the genus this species calls for some moments from its hiding place in a thicket before it comes out for its evening flight. The song consists of a series of rapid notes of such quality and phrasing that it may be said to sound like a Katydid (*Pterophylla*). The phrasing varies somewhat in different parts of the country but the quality and effect is the same so that all are readily recognized. One song may be represented as "Cuk-cuk-cuk-cuk-acheeah-cheea"; this effort requires about one second of time and may be repeated 11 times in 25 seconds. A longer one may be given as "Cuk-cuk-cuk-cuk-cu-cu-cu-cu-cu-cu-cu-cu-cu-cu-cu-cu-cu-acheea." This whole song requires about two seconds and may be repeated at such a rate that four will be given in 15 seconds. The "cu" is pitched about the third A above middle C and the highest part of the "chee" is about four notes higher. This species was encountered from sea level up to over 4000 feet elevation, usually in rather open, semi-arid woods or in brushy "islands" in savannahs.

Sayornis saya. Say's Phoebe.—Although this species is frequently reported rather far south in the plateau region of Mexico in winter, it is seldom encountered in the summer months. On June 29, 1952, Richard Herbert and I found a pair of these birds feeding young in a nest on the wall of a very narrow, slit-like gorge on an arid hillside about 90 miles (via the Pan American Highway) northwest of the city of Oaxaca.

Empidonax mexicanus. Pileated Flycatcher.—Although this bird (usually listed as *Aechmolophus mexicanus*) has a longer and more pointed crest than other members of the genus *Empidonax* its appearance in the field suggests one of the browner members of that group, and field students always attempt to look it up in that genus when they first encounter it. (The crest is more often than not decumbant and seldom raised more than half way; hence they do not notice it.) Consequently, it would seem to be helpful to recognize the bird as belonging to that genus. The nest resembles that of the Acadian Flycatcher (*E. virescens*) and the song suggests the Buff-breasted Flycatcher's (*E. fulvifrons*) though better developed and stronger. The song starts with a chatter but quickly goes into a trill which becomes louder and faster, and then bursts into a sharply accented "ReeChoo." The "Ree" is pitched about the fourth A above middle C. The whole song may be represented as, "Ra re ee-e-e-e-e-ReeChoo"; it requires about one and a quarter seconds. Encountered most frequently in semi-arid woods at from 4000 to 5000 feet elevation, the bird seems to be most common from western Puebla to central Oaxaca.

Cissilopha beecheii. Beechey's Jay.—Although sometimes confused with the San Blas Jay (*C. san-blasiana*) this species is quite distinct in the field. It lacks the small frontal crest of the San Blas Jay, is larger, and has a conspicuous yellow iris (that of the San Blas Jay is pale yellow or brown); also the voices are quite different. The velvet-like feathers along the sides of the cap stand up somewhat so that the fore part

of the crown appears sunken; this gives the bird a "raised eyebrows" look. The call is a rather soft "jaay," which is so nasal and burry that it is probably better represented as "Jerrr" or "Jurrr," according to the pitch, which varies with different individuals from about the first F above middle C up to the first A above it. The sound is almost like that of a fly buzzing under a piece of paper. A single call may be given, or a slow series, or as many as 10 may be given in a space of five seconds.

Cissilopha yucatanica. Yucatán Jay.—In the field this species appears like the Beechey's Jay except that it does not have the yellow iris. Instead of having a frontal crest as in the San Blas Jay, all the feathers of the head seem to be very slightly elongated. When the bird is excited it sometimes erects these feathers and the whole head appears to be somewhat fuzzy. This species makes a loud, harsh clatter or rattle that is suggestive of the call of a Great-tailed Grackle (*Cassidix mexicanus*). There is also a rather loud, sharp, "Pip"; and a series of clear, high-pitched, titmouse-like notes. This last mentioned song may be represented as, "Chea-chea-chea-chea-chea"; this requires one second of time and the "chea" note is pitched about the fourth G above middle C. (The last part slurs down about one tone but this is scarcely noticed since the call is so fast.) This song might be confused with the clear "che" song of the Petén Vireo (*Vireo semiflavus*) but it is given only at random whereas the vireo usually repeats his song a number of times. It might also be confused with the song of the Orange Oriole (*Icterus auratus*), but that bird places a short preliminary phrase ahead of its series of "che" notes. The loud "chea" song of the Yucatán Jay may be preceded by a fairly loud call, "Eyah," of a somewhat nasal quality. This requires from one fourth to a third of a second and is pitched about an octave lower than the "chea."

Vireo semiflavus. Petén Vireo.—While field studies do suggest that this bird is a member of the Mangrove Vireo complex (*pallens* "artenkreis"), it does not seem likely that any field student would take seriously the suggestion made by some taxonomists that it is a race of the White-eyed Vireo (*V. griseus*). In the field, the eyes of breeding adults seem to be quite dark, and have a beady appearance somewhat like those of the Hutton's Vireo (*V. huttoni*). The song consists of a series of identical notes. In one case there is a clear "che" repeated eight times in two seconds; the pitch is about the fourth G above middle C. Other songs are similar but of a somewhat nasal quality. There is a series of "weo" notes and a series of "chu" notes, both given at the rate of eight in two seconds. (The song may however continue for more than two seconds.) There is also a much faster song which is just a rattle of some 20 "chu" notes in two seconds. (The bird vibrates his tail as he does the rattle). The call used as a warning or alarm note is a slightly nasal, vibratory, "Queeee," which lasts about one second. In the Yucatan Peninsula this species is common in rather open areas of second growth woods, and in the region of low scrub both inland and along the coast. This is quite different from the habitat selected by the Mangrove Vireo (*V. ochraceous*), which seems to be confined entirely to the mangrove swamps along the Pacific Coast. The Mangrove Vireo, however, shows close relationship in the form of his song, which is also a series of "che" notes. Aside from the indistinct wing bars and the incomplete yellow eye ring, the Petén Vireo looks very much like the Golden Vireo (*V. hypochryseus*) in the field, and it happens that the song of the Golden Vireo is also a series of "che" notes.

Icterus spurius. Orchard Oriole.—Except for a small colony on the banks of the Rio Grande in extreme northeastern Tamaulipas, this species (in Mexico) is confined during the breeding season to high tableland from Coahuila southward. The colonies are small and isolated and usually situated in irrigated areas. The adult males are quite dark. Orchard Orioles nest during June and seem to return to the same area each year. Two

adult males were observed feeding young in different nests located about 20 miles south of Zamora, Michoacan, on June 19, 1953. The species was first observed in the area in June, 1941, and the colony was still present in the summer of 1956. The song of the Mexican birds is of the same quality and style as that of Texan population. The form of the song of this species is so variable from individual to individual that it is not possible to make fine points of distinction on the phrasing. The form of the song of Fuertes' Oriole (*I. fuertesi*) varies in the same way and this makes it extremely difficult to compare the songs of the two species. It may be noted that Fuertes' Oriole is a bird of the eastern lowlands (during the breeding season) where the nearest individuals are 200 miles or more away from any known breeding Orchard Orioles; and, as has been pointed out by the Grabers (1954. *Condor*, 56:274–281), the lightest Orchard Oriole male is darker than the darkest of the Fuertes Orioles (there are no intergrades). The Fuertes Oriole seems to be quite common locally at the extreme northern limit of its range, in southern Tamaulipas. Nesting begins in Tamaulipas about the middle of May; a pair was observed with young out of nest in southern Veracruz (La Piedra) on June 29, 1952, which would seem to indicate that they nest no earlier in the south.—L. Irby Davis, *Box 988, Harlingen, Texas, January 10, 1957.*

Notes on the Red Crossbill in Minnesota.—The country-wide invasion of Red Crossbills (*Loxia curvirostra*) in the fall, winter and spring of 1950–51 (Tordoff, 1952. *Condor*, 54:200, and others) was but poorly recorded in Minnesota. Two sight records were published (Oman, 1951. *Audubon Field Notes*, 5:139, and Flaherty, 1952. *Flicker*, 24:25), and four specimens were preserved. The identification of these specimens and the re-identification of the 23 other Minnesota specimens of the Red Crossbill in the University of Minnesota Museum of Natural History collection reveal the need for several changes in the taxonomic appraisal of this species as presented by Roberts (1936. "The Birds of Minnesota"). An additional 11 Minnesota specimens from the collection of H. F. Kendall of Virginia, Minnesota, were examined. Sheridan S. Flaherty (*loc. cit.*), of Morris, Minnesota, kindly loaned photographs of the Red Crossbills that visited his feeding station between March 23 and May 31, 1951. One or more birds were seen daily during that period, with nine seen on the latter date. They were believed to be preparing to nest, although this seems improbable since Morris is situated in the prairie region of central western Minnesota. The subspecific identity of the birds could not be determined.

The material studied confirms Griscom's statements (1937. *Proc. Boston Soc. Nat. Hist.*, 41:5) that the races *minor* and *sitkensis* (of the American Ornithologists' Union Check-list, 1931) occur in Minnesota, and allows us to add the race *benti* to the state checklist. Apparently Griscom did not include in his monographic revision the Minnesota specimens recorded in this study.

These specimens are identified as follows:

Loxia curvirostra sitkensis.—Five females measure: wing, 77.3–82.0 mm.; culmen, 13.3–14.3; two males measure: wing, 83.0 and 83.5; culmen, 14.2 and 14.7. Also the culmen (rhinotheca *in situ*) of one male skeleton measures *ca.* 14.8 mm. Dates represented are July and August, 1922 (five specimens); May, 1923 (one); and January, 1951 (two).

Griscom (*op. cit.*:124) lists specimens of this form from Illinois taken in April and June, 1923, but apparently he did not recognize these as indicative of an extensive flight year. There are four specimens of *sitkensis* in the Louis Agassiz Fuertes Collection at Cornell University taken at Ithaca, New York, in January, 1923.

Loxia curvirostra minor.—Four females measure: wing, 83.2–88.3 mm.; culmen, 15.0–17.0; 12 males, wing, 86.8–93.0; culmen, 15.1–17.4. Ten of these were breeding birds taken by T. S. Roberts at Grand Marais, Cook Co., northeastern Minnesota, August, 1879. The only post-1900 specimen in the University of Minnesota Museum of Natural History collection is a male found dead near Minneapolis on February 22, 1956. There are apparently no valid records of *minor* outside the boreal regions during the 1950–51 flight (Tordoff, *loc. cit.*) of the western populations.

Roberts (*loc. cit.*) cites several sight records of juvenal Red Crossbills, but to date no specimens from the state have been reported. The collection of H. F. Kendall contained 11 Red Crossbills taken between August 12 and October 4, 1931; all in various stages of post-juvenal molt. However, the progress of this molt does not correlate with the date on which a given specimen was collected. A male taken August 20 has nearly completed the molt, whereas two males and a female, taken August 30 and September 1, have but a few new feathers on the back, throat and breast. Males taken on August 12 and 20 have more than half completed this molt, while a male taken October 4 has replaced fewer than half his juvenal feathers. The males are acquiring the mottled plumage ascribed to first winter birds of the eastern race, with red and green feathers interspersed. Most of these specimens show evidence of having been rather fat when collected. The two females measure: wing, 90 and 91 mm.; culmen, 17.0; males, wing, 89.7–93.4; culmen, 16.1–17.6. Gratitude is expressed to Mr. Kendall for his loan of these birds.

Loxia curvirostra benti.—Two crossbills of this race flew into a window during a snowstorm on November 15, 1950, in a suburb of Minneapolis. These were an adult male and a first-year male; they measure, respectively: wing, 98 and 90 mm., culmen, 20.5 and 18.7.

Appreciation is expressed to Harrison B. Tordoff who examined certain specimens, and confirmed identification of those representing the race *benti*.—Robert W. Dickerman, *University of Minnesota Museum of Natural History, Minneapolis, Minnesota, April 30, 1957.*

The look-out perch as a factor in predation by Crows.—On the grounds of the Preston Laboratories at Butler, Pennsylvania, we normally have a couple of dozen Mallards (*Anas platyrhynchos*) of which about 10 are females. They are fully flighted, and nest over a wide area inside the fence (100 acres) and sometimes outside it. We also have a pair of Common Crows (*Corvus brachyrhynchos*) which destroy all the early nests and most of the later ones, and also (apparently) catch the ducklings. This predation is successful to the point of holding the numbers of ducks to about two dozen, the number of ducklings raised per annum being three or four at this population density. It is probable that other predators help, perhaps raccoons (*Procyon lotor*) and opossums (*Didelphis marsupialis*) more particularly, but since eggs disappear from nests in the middle of the day and the other predators are essentially nocturnal, and since we observe the crows watching and searching, we believe that the crows are the effective agents. Each female duck probably makes at least three attempts to nest, and probably lays in excess of 20 eggs, since there are often 15 or more eggs in the first nest, though only half a dozen or so in late ones. Out of some 200 eggs, probably 20 hatch, 15 ducklings reach the water, and 3 or 4 are raised. This is an efficiency of about 2 per cent, and is much lower than Lack (1954. "The Natural Regulation of Animal Numbers," p. 79) gives in his tabulation.

The crows also discover and destroy the nests of Ring-necked Pheasants, (*Phasianus*

colchicus) and even peafowl (*Pavo cristatus*). When eggs or ducklings are not available, they will condescend to eat the grain we set out for the ducks. There is no evidence that these particular crows or their offspring search for dead rabbits along the neighboring roads, and I am not sure that they eat dead fish stranded by the lake or brought ashore by raccoons. They probably have sources of food other than those here mentioned, though it would not be necessary.

The crows sit in the treetops, and watch for the duck to go to her nest. At the time of first nesting the herbage is low, and, although the nest itself may be well hidden under a low evergreen, the duck must necessarily betray it.

On the later nestings, the nest is equally well hidden, usually among tall weeds and grasses, but the duck now has the advantage that she can sneak through such cover for many yards, and sometimes the crows do not find the nest. If the nest is well away from the water, the raccoons do not find it either. All goes well till the ducklings hatch, and then the mother must quack to call the ducklings to follow her to the lake. The crows appear to know what that means as well as do the ducklings. They fly to the tree nearest the sound, and each crow apparently captures its duckling. Thus, on June 25, 1955, in one nest in which nine of 11 eggs hatched, three crows settled in the oak tree nearest the nest, and six ducklings reached the water, where I saw them on June 26. It seems fairly clear what happened to the others. Then the crows moved down to trees by the lake, sometimes at one end thereof, sometimes at the other, depending, apparently, on where the mother and her brood were. By noon of June 28, the family was reduced to three, and by 7:00 p.m. the same day was down to one. The ducklings were safe on the water, but in danger when they came ashore and they disappeared one after the other till not one was left.

The Wood Ducks (*Aix sponsa*) which nest with us seem to be much more successful. To begin with, they nest in holes, or in the boxes we put up for them, and perhaps the crows do not like to venture into boxes. Some nests no doubt are destroyed, but most likely by other predators. None the less some of the early clutches hatch out, and by just about 100 per cent. The young are kept "out at sea" among the lily pads to a much greater extent than young Mallards, and there they are safe from both crows and hawks. When they do go ashore, the mother seems able to protect them and is very alert to place herself between the danger and the ducklings. In two or three years' observation, involving some scores of young, we have observed that very few were lost once they were hatched. In some way the Wood Duck is adapted to the presence of crows and able to outwit them, while the Mallard is extremely vulnerable.

This brings me to the main point, or question, of this memorandum. Logan J. Bennett (1938. "The Blue-winged Teal") several times comments on the incompatibility of trees and teal. He ascribes this to the fact that herbage does not grow well under trees to provide good nesting cover for the ducks, and also to the fact that trees provide nesting sites for Crows and Horned Owls (*Bubo virginianus*). These are valid reasons, but I here raise the question whether the bad influence of trees may not be more direct. The trees are lookout perches from which a crow may survey a meadow or prairie and locate duck nests by the movements of the mother. In the absence of the perches, the crow is relatively helpless, even if he has a good nesting site within commuting distance. He cannot hover, and if he cruises about overhead, he will use up a lot of energy, and even then may not be well-placed to survey the situation. I find that our crows use dead trees, trees not yet in leaf, and power poles to watch what goes on, and I suspect that if I could remove all elevated perches of this kind for a quarter mile around the lakes, Mallard hatching success would be much greater, and probably raising success also. I

offer this as a suggestion, without proof, since I am not in a position to make the experiment.

The behavior of the crow is similar to that of Brown-headed Cowbirds (*Molothrus ater*). They also sit in the treetops, watching for small birds to carry nesting material to their nests, so that the cowbird knows where the nest is before the first egg is laid. Sometimes she lays the first egg herself (Norris, 1947. *Wilson Bull.*, 59:92).

The effectiveness of this elevated look-out perch is clear from the behavior of the Eastern Bluebird, *Sialia sialis*, (Preston, 1948. *Wilson Bull.*, 60: 120) of the Loggerhead Shrike (*Lanius ludovicianus*) and other species.

We have seen that the crows are ineffective against the Wood Duck. They are also ineffective against our Canada Geese (*Branta canadensis*) or our Egyptian Geese (*Alopochen aegyptiacus*). This is probably because both parents keep a tight control over their young, and are very bellicose in their defense. The young come ashore freely, but the crows get few or none. It would probably be a very rash crow that attempted it.

In England as a boy I often found Mallard nests in hollow trees, and hence in wooded areas, but the game keepers had cleared out the Carrion Crow (*Corvus corone*) in those sections.

It would seem possible that one reason the great nesting grounds of many species of our North American ducks are in the prairies is because originally the prairie was treeless, thereby putting the crow at a disadvantage. Potholes, kettles, ponds and lakes exist in forested regions, and in partly wooded regions, and probably food is plentiful there, but the nesting ducks in such places are few, and largely those that nest in hollow trees.

Perhaps the predators' look-out perch is the clue to the situation, and the prairies could be depopulated of ducks by a modest amount of tree planting supplemented with lines of telephone poles. At any rate the crow has increased in the prairies with the coming of settlement, and is now an important factor in waterfowl predation there.

Perhaps as a sort of appendix I may be permitted to add an account of the behavior of the Carrion Crow as a predator on the Red Grouse (*Lagopus scoticus*) on the Scottish moors. This is secondhand information given to me by a gamekeeper in northern Scotland in 1949, when I spent some time with him after the main nesting season.

"When the hen grouse is incubating, the cock frequently sits conspicuously upon a rock or other perch at a little distance. The crow, observing him, alights on another neighboring rock and waits to see if he is attacked. If he isn't, he moves to another perch and repeats this till he *is* attacked. He then knows the hidden female is near, and looks around till he finds her. He then fights with the female. In the melee the eggs are scattered, which is the crow's objective. He can then gather them at his leisure, while the grouse must abandon the site. This goes on as long as the crow has young in the nest, and so effective are the tactics that no grouse can hatch its eggs in the crow's territory. However, when the young crows have left the nest, the crows seem much less interested in eggs. The grouse then renest and may have a fair measure of success." This complete suppression of the early nestings of the grouse and the incomplete suppression of the late renestings agrees exactly with what we observe with the Mallards on our Laboratory grounds.—F. W. Preston, *Box 149, Butler, Pennsylvania, June 13, 1957.*

Broad-winged Hawk in Coahuila.—On July 6, 1955, I obtained a Broad-winged Hawk (*Buteo platypterus platypterus*) 13 miles east of San Antonio de las Alazanas, Coahuila, in a Douglas fir-pine-aspen association. The specimen (KU 32628), an adult male, lacked the right foot and distal one-third of the tarsus. Despite this abnormality the animal was not emaciated. Pertinent measurements, in millimeters, were: right testis,

6 × 3; left testis, 7 × 2; wing, 274; culmen from cere, 18.1; middle toe without claw, 26.5. Because of the migratory habit of this species, its occurrence in Coahuila and other northern states of Mexico would be expected. Previously, however, the Broad-winged Hawk has been recorded in the Republic of Mexico only from the more southern states of Sinaloa, Jalisco, Colima, Oaxaca, Chiapas, and Veracruz (Friedmann, Griscom, and Moore, 1950, *Pacific Coast Avifauna* no. 29: 56). This species is known to breed as far south as Texas, the Gulf States and Florida. The condition of the testes of the Coahuilan bird suggests that it was not in breeding condition. This hawk, if a migrant, may have been retarded from moving northward by the loss of its foot.—Robert L. Packard, *University of Kansas, Museum of Natural History, Lawrence, Kansas, May 17, 1957.*

A pallid-eyed individual of *Dumetella carolinensis*.—From April 25 thru May 31, 1957, I banded 55 Catbirds (*Dumetella carolinensis*) at my station in Addison Township, Oakland County, Michigan. On May 13, I caught and banded (55-147402) one which, instead of the normal dark purplish-brown, had extremely light-colored eyes. The outer margins of both irises were very pale gray, even lighter than platinum gray. Every detail of plumage was normal. I regret to report that the bird escaped while I was carrying it to the house where I intended to photograph it.—Alice D. Miller, *1150 Brewer Road, Leonard, Michigan, July 21, 1957.*

WILSON ORNITHOLOGICAL SOCIETY NEWS

THE JOSSELYN VAN TYNE MEMORIAL LIBRARY

In recognition of the leadership and service of the late Josselyn Van Tyne to the Wilson Ornithological Society, the Executive Council, at its meeting in June, 1957, voted to rename the Society's library the Josselyn Van Tyne Memorial Library. Subsequently Mrs. Van Tyne announced her plan to present the bulk of Dr. Van Tyne's personal library to the Wilson Ornithological Society. Included in this gift are a number of virtually unobtainable items, among them Stresemann's "Aves," the complete set of the Aves section of the *Zoological Record*, and the reprints on birds from the publications of the Museum of Comparative Zoology. The Wilson Ornithological Society is deeply indebted to Mrs. Van Tyne for her generosity, and we hope that this development will be followed by the increased growth and use of the Josselyn Van Tyne Memorial Library.

THIRTY-NINTH ANNUAL MEETING

The Annual Meeting for 1958 will be convened at Oglebay Park, Wheeling, West Virginia, April 24 to 27. Sponsors for this meeting are the Brooks Bird Club and the Oglebay Institute. A call for contributions to the program will be mailed to members soon.

LOUIS AGASSIZ FUERTES RESEARCH GRANT

Application forms for the 1958 Louis Agassiz Fuertes Research Grant may be obtained from the chairman of the Research Grant Committee, Dr. Kenneth C. Parkes, Carnegie Museum, Pittsburgh 13, Pennsylvania. A grant of $100 is awarded annually by the Wilson Ornithological Society as an aid to the completion of the research project which, in the judgment of the Committee, seems most likely to make an important contribution to ornithology. Affiliation with a university is not required, and applications from non-student amateurs are invited. Prospective applicants will find a detailed account of the history of the Fuertes Research Grant in the December, 1955, issue of *The Wilson Bulletin*.

The deadline for applications for the 1958 Grant will be April 1. The decision of the Committee will be announced at the annual meeting in Wheeling on April 25, and published in the September issue of *The Wilson Bulletin*.

The National Science Foundation will award grants to defray partial travel expenses for a limited number of American scientists who wish to participate in the XIIth International Ornithological Congress, scheduled to meet in Helsinki, Finland, June 5 to 12, 1958. Application forms may be obtained from the National Science Foundation, Washington 25, D.C., and must be returned by January 20, 1958.

Ornithologists who plan to submit applications for grants from the Frank M. Chapman Memorial Fund should do so before March 15. Awards from this fund are made annually to assist younger scientists conducting research in any branch of ornithology. Further information may be obtained from the Chairman, Chapman Memorial Fund Committee, The American Museum of Natural History, New York 24, N. Y.

The American Ornithologists' Union will meet in New York, October 14 to 19, 1958, on the occasion of the Union's 75th Anniversary. This meeting is sponsored jointly by the Linnaean Society of New York, The National Audubon Society, the New York Zoological Society, and the American Museum of Natural History.

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ORNITHOLOGICAL LITERATURE

BIRDS OF PINE-OAK WOODLAND IN SOUTHERN ARIZONA AND ADJACENT MEXICO. By Joe T. Marshall, Jr. Cooper Ornithologial Society, Berkeley, California; Pacific Coast Avifauna Number 32, 1957: 7 × 10½ in., 125 pp., frontispiece, 26 figs., 1 color plate. Illustrated by Don R. Eckelberry. Price: $4.00 (paper covers), $5.00 (bound with buckram).

It is gratifying to note, among the increasing deluge of published material on the Mexican avifauna, some recent progress beyond the faunal list and geographical distribution stage of investigation. Marshall's study is an interpretation of the abundance and ecological distribution of the breeding birds of the pine-oak woodland of southeastern Arizona and the neighboring Mexican states of Sonora and Chihuahua. The report is based on censuses and observations of behavior made during the summers of 1951, 1952, and 1953. It may rightfully serve as a model for similar analytical work on other equally interesting biotic communities of Mexico.

Approximately one-quarter of the book is devoted to the floristic composition and general vegetational features of the study area, including descriptions of the various camps and dates of visitation. Another quarter deals with census methods and general aspects of the avifauna, among which are habitat selection, competition, history, and factors limiting distribution. The remaining half of the book consists of accounts of 170 species, 93 of which are considered to nest regularly and/or feed in pine–oak woods. These accounts consist largely of observations of local behavior, habitat perferences, and interspecific relationships. Binomials are used throughout, since the distinction of subspecies is not an expressed purpose of the study. There is a four page bibliography but no index.

Seventeen photographs help the reader to envisage the physiognomy of this ecotone community. There are nine tables and six maps. A pair of Spotted Screech Owls painted by Don Eckelberry makes an appropriate and attractive frontispiece. Black and white drawings by Eckelberry depict three more pine-oak species: Olivaceous Flycatcher, Bush-tit, and Hutton Vireo. The single color plate of a pair of Olive Warblers, also by Eckelberry's talented hand, will be familiar to readers of the *Condor* (vol. 58, no. 2). Its inclusion in the present Cooper Society publication presumably was regarded as a financial *coup de maitre*, but unfortunately may give the erroneous impression that this is another indicator species of pine-oak woods.

Pine-oak woodland was apparently selected not as an entity but rather as a convenient division of an over-all continuum of vegetation that might be used to study the ecological needs of birds and their consequent abundance and distribution. This is a healthy and refreshing attitude in view of the tendency of some contemporary workers to emphasize the discreteness of natural communities. "Species and their populations are the realities to be seen; their sortings and mixtures can be classified less objectively . . . . Only after we realize these facts can we permit ourselves the luxury of speaking of vegetation types, associations, or communities as may be necessary for discussing the distribution of birds" (p. 39).

Marshall's style of writing is anecdotal, descriptive, and chatty. Those who prefer their scientific reading concise and telegraphic will regard many of the author's comments as trivial and inconsequential. Such is the plight of most writers who abhor the thought of omitting any detail on the grounds that it may be useful or significant to someone, sometime.

In general, care has been exercised by both author and printer for there appear to be

few errors or omissions. Exceptions are apparently inevitable, as evidenced by the misspelling of "Olivaceous" on figure 24 and the incomplete labeling of figure 3 (*Pinus durangensis*) and of figure 21 (Rusty Sparrow). The author had some difficulty with his herpetological material: *ochrorhyncha* (misspelled on p. 76) has been replaced generally by *torquata*; *Coleonyx* is misspelled on page 76.

One might question the efficacy or even purpose of certain tables and figures in this work. The complexity and variability of bird behavior make its presentation in tabular form difficult and too frequently misleading. Feeding behavior, for example, may be presented in a far too typological vein (table 5). Data on the geographical limits of pine-oak birds do not merit repetition in three forms of editorial expression: map (fig. 21), table (table 9), and text (pp. 45 and 67). The use of scientific names in table 2 and common names in table 3 presumably enables the reader to interpret the former, if necessary; but table 3 contains more species, hence the entries are not comparable.

The author demonstrates a good grasp of the vegetation of the study area, which could only have been developed by carefully observing and collecting over a period of years. This knowledge has been used to best advantage in interpreting the ecological needs of the birds in his study area. His analysis of a number of prominent biological topics is critical and erudite. The views on "ecologic" races and competition (pp. 53–60), for example, will be of interest to many readers.

Anyone who has had field experience within Marshall's study area will be appreciative of the obstacles that he must have overcome in compiling the amount of data presented in this publication. The inaccessibility of most of the isolated mountain ranges, coupled with the limited time available to university faculty for field work have unquestionably discouraged many less determined workers. We can only hope that Marshall will give us a repeat performance with other segments of the Mexican avifauna.—Wesley E. Lanyon, *American Museum of Natural History, New York 24, New York.*

Ornithologists are indebted once more to Col. W. P. C. Tenison for his compilation of the Aves section of the *Zoological Record*, listing and indexing the world literature of ornithology for 1956. This volume may be purchased from the Zoological Society of London for 10 shillings.

INDEX TO VOLUME 69, 1957

This index includes, in addition to names of species and authors, references to the following topics: behavior, conservation, embryology, food habits, hybrids, geographic localities, growth, measurements, migration, molts and plumages, nesting, parasitism, physiology, populations, predation, taxonomy, voice, and weights. References of biological significance to mammals and reptiles are grouped under those headings. Names of new forms described in this volume are printed in **boldface** type.

Accipiter cooperii, 62, 111, 184, 263
  striatus, 52, 58, 62, 184
Acridotheres cristatellus, 234
  fuscus, 234
  ginginianus, 234
  tristis, 208, 234
Acrocephalus scirpaceus, 89
Actitis macularia, 53
Aechmolophus mexicanus, 365
Aegolius acadicus, 178
Agelaius, 183
  phoenicius, 103, 182, 233, 276
Ailuroedus crassirostris, 234
Aix, 291, 296, 297, 299
  galericulata, 291–300
  sponsa, 16, 280, 291–300, 369
Alauda arvensis, 330, 331
Alberta, 338, 339, 348
Alcedinidae, 59
Alectoris graeca, 230
Allen, Arthur A., photograph by, opp. 195
Allen, Durward L., "Pheasants in North America," reviewed, 117–119
Allen, Robert Porter, "The Flamingoes: Their Life History and Survival," reviewed, 189–190
Alopochen aegyptiacus, 370
Amazilia tzactl, 275
  yucatanensis, 275
Amazona autumnalis, 274
  leucocephala, 304
  viridigenalis, 274
Ammodramus savannarum, 55
Anhinga, 51, 52
  anhinga, 52
Anas, 31, 291, 296–299
  acuta, 15, 52
  americana, 15
  carolinensis, 52
  clypeata, 21
  crecca carolinensis, 109
  cyanoptera, 15
  discors, 21, 52, 279, 280
  platyrhynchos, 15, 52, 181, 280, 292, 294, 295, 296, 363, 368
  rubripes, 31, 280
  strepera, 21, 52
  superciliosa, 16
Anatidae, 299
Anatinae, 291
Ani, Groove-billed, 305
  Smooth-billed, 106, 305–306
Anser albifrons, 166, 169
  anser, 10, 292, 295, 296
  arvensis, 10
  caerulescens, 21
Anseriformes, 51
Ant-Tanager, Red-throated, 233
Anthus pratensis, 247
  spinoletta, 54
  trivialis, 230, 248
Antiurus maculicaudatus, 364
Apodiformes, 59
Apostle-Bird, 234
Apus apus, 248
Aquila chrysaetos, 106–107
Aramus guarauna, 311
Archilochus, 157, 158
  colubris, 53, 155–163
Ardea herodias, 52
  occidentalis, 106
Arenaria interpres, 53
Arizona, 164
Asio flammeus, 53, 111
Asyndesmus lewis, 166
Athene noctua, 248
Avocet, 112
Aythya, 25, 26, 31
  affinis, 21, 52
  americana, 5–34, 52
  collaris, 17, 52
  ferina, 24
  fuligula, 7
  valisineria, 15–17, 52

Bailey, Alfred M., Hudsonian Godwit in Colorado, 112
Baldpate, 182
Bambusicola thoracica, 329, 331
Bartholomew, George A., and Tom J. Cade, The body temperature of the American Kestrel, Falco sparverius, 149–154
Bartlett, L. M., Ring-billed Gull steals food from Coot, 182
Bartramia longicauda, 53
Becard, Black-capped, 275
Gray-collared, 275
Behavior, 78–90, 105, 107, 108, 111, 113, 128–129, 170–177, 179–181, 182, 184–188, 195–251, 266–270, 276, 280, 306–310, 321, 361–364, 368–370
Berger, Andrew J., Population density of Alder Flycatchers and Common Goldfinches in Crataegus habitats of southeastern Michigan, 317–322
Berger, Daniel D., A peculiar type of flight in Cooper's Hawk, 110–111
Bishop, Fire-crowned, 234
Orange, 208, 234
Taha, 234
Bittern, American, 52, 342
Least, 48, 50, 51, 52, 362
Blackbird, Brewer's, 102–105, 276
European, 207, 231
Melodious, 276
Red-winged, 103, 104, 183, 233, 276
Yellow-headed, 183
Bluebird, 248
Eastern, 370
Bobolink, 51, 55, 70, 73, 233
Bombycilla cedrorum, 54, 184, 230, 248
Bombycillidae, 65, 230
Bonasa umbellus, 230, 248
Botaurus lentiginosus, 52, 342
Bowerbird, Satin, 234
Brambling, 233
Branta canadensis, 10, 370
c. leucopareia, 181
Breckenridge, W. J., review by, 190–191
British Columbia, 238
Bubalornis, 233
albirostris, 233
Bubo virginianus, 230, 263–272, 369
Bucephala clangula, 21, 31
Bullfinch, Cuban, 311
Bunting, 228
Indigo, 55, 74, 207, 212, 226, 232
Lazuli, 232
Meadow, 325, 326
Orange-breasted, 233
Painted, 51, 55, 74, 200, 214, 240, 311
Buss, Irven O. and Helmer Mattison, "A Half Century of Change in Bird Populations of the Lower Chippewa River, Wisconsin," reviewed, 190–191
Buteo jamaicensis, 169, 180, 181, 263–272, 274
lagopus, 274
lineatus, 263
platypterus, 41, 52, 263, 304, 370
regalis, 279
swainsoni, 166, 274
Butorides virescens, 52, 82, 184
Cade, Tom J., see Bartholomew, George A. ———
Cairina moschata, 291–300
Cairinini, 291, 299
Calidris canutus, 53
California, 165
Callipepla, 145
squamata, 196, 197, 230, 280
Calospiza cyanicollis, 233, 245
cyanoventris, 233
fatuosa, 233
Camptostoma imberbe, 167
Campylopterus curvipennis, 274
Capella gallinago, 53
Capercaillie, 230
Caprimulgidae, 59
Caprimulgus carolinensis, 51, 53
cubanensis, 306
maculicaudatus, 364
ridgwayi, 365
vociferus, 113
Cardinal, 79, 80, 82, 83, 84, 85, 86, 87, 108, 109, 214, 232, 236
Cardinal, Brazilian, 232
Cardinalis cardinalis, 214, 232
Cardinalinae, 232
Carduelinae, 233
Carduelis cannabina, 247
Carpodacus mexicanus, 79
purpureus, 84, 85
Casmerodius albus, 52, 184, 185
Cassidix mexicanus, 167, 233, 366

Catbird, 54, 64, 75, 80, 82, 85, 86, 207, 230, 234, 309–310, 371
Cathartes aura, 52, 304
Catharus, 362
fuscescens, 231
guttatus, 231
minimus, 231
ustulatus, 231
Catoptrophorus semipalmatus, 53
Centropus superciliosus, 113
Centurus aurifrons, 80, 82, 196, 230
carolinus, 80, 82, 85
superciliaris, 308
Chaetura pelagica, 40, 53
vauxi, 165
Chaffinch, 224, 233
Charadriidae, 58
Charadrius alexandrinus, 106
hiaticula, 52
vociferus, 109, 278–279
wilsonia, 52
Chat, Yellow-breasted, 55, 73
Chicken, Domestic, 26, 230
Chiapas, 361
Chlidonias niger, 53
Chloris sinica, 332
Chloropsis aurifrons, 230
jerdoni, 230
Chlorostilbon ricordii, 306
Chondestes grammacus, 179–180
Chordeiles minor, 50, 51, 53, 110, 306, 365
m. minor, 306
m. gundlachii, 306
Chough, White-winged, 197
Chukar, 230
Chuck-will's-widow, 50, 53, 59
Ciconiiformes, 51
Cinclidae, 230
Cinclus cinclus, 230
pallasi, 224, 230
sp., 230, 244
Circus cyaneus, 52, 111, 274
Cissolopha beecheii, 210, 235, 365
yucatanica, 366
Claravis pretiosa, 274
Coahuila, 370
Coccothraustes coccothraustes, 233
Coccyzus americanus, 53
erythropthalmus, 53, 109
Cockatoo, 208, 230
Coerebinae, 233
Colaptes auratus, 80, 82, 85, 181, 196, 230
Colinus, 145
virginianus, 91, 197, 304
Coliuspasser ardens, 233
macrocercus, 233
Collett, F. M., Nesting of the Bahaman Yellowthroat, 183
Colluricincla parvula, 232
Colorado, 107
Columba flavirostris, 276
inornata, 304
leucocephala, 304
livia, 170–177
squamosa, 304
Columbidae, 59
Columbigallina passerina, 53, 80, 82, 106, 304
talpacoti, 274
Colymbiformes, 51
Contopus caribaeus, 308
virens, 82
Connell, Clyde E., see Norris, Robert A.

Conservation, 301
Coot, American, 52, 58, 181, 182
Copsychus malabaricus, 217, 231
saularis, 217, 231
Corcorax melanoramphus, 197
Corvidae, 234
Corvus brachyrhynchos, 198, 235, 266, 368
caurinus, 225, 235
corax, 235
corone, 206, 235, 241, 330, 370
c. cornix, 235
frugilegus, 206, 235
imparatus, 275
levaillantii, 330
monedula, 248
nasicus, 308
ossifragus, 185, 308
palmarum, 308
Cotter, William B., Jr., A serological Analysis of some anatid classifications, 291–300
Cottrille, Betty Darling, see Walkinshaw, Lawrence H. ———
Cottrille, W. Powell, see Walkinshaw, Lawrence H. ———
Coucal, African, 113

Cowbird, Brown-headed, 103, 104, 233, 278, 279, 319, 370
Red-eyed, 276
Cracticidae, 234
Crane, Sandhill, 106, 311
Crocethia alba, 53, 187–188
Crossbill, Red, 367
Crotophaga ani, 106, 305
sulcirostris, 273, 276, 305
Crow, American, 326
Carrion, 206, 210, 211, 214, 224, 225, 227, 229, 235, 238, 241, 242, 243, 245, 325, 326, 330, 370
Common, 198, 207, 212, 225, 227, 229, 235, 246, 248, 368–370
Cuban, 308
Fish, 185, 308
Hooded, 235
Jungle, 325, 330
Mexican, 275
Northwestern, 225, 235, 243, 245
Palm, 308
Crypsirina bayleyi, 235
Cuckoo, Black-billed, 53, 59, 109
Cuban Lizard, 304
Yellow-billed, 53, 57, 59, 168
Cuculidae, 59
Curlew, Hudsonian, 53, 58
Long-billed, 53, 58
Cyanerpes cyaneus, 311
Cyanocitta cristata, 80, 82, 85, 210, 235
Cyanopica cyanus, 235, 331
Cyclarhis gujanensis, 275, 276
Cyornis, White-bellied, 232
Cyornis tickelliae, 232
Cyrtonyx, 123
Dacnis cayana, 217, 233, 245
Dactylortyx thoracicus, 123–148
t. **calophonus**, 140, 142, 144
t. chiapensis, 133, 134, 137–138, 139, 140, 142
t. **conoveri**, 142, 143, 144
t. devius, 132, 135–136, 142, 144
t. **dolichonyx**, 138, 139, 140, 142, 144
t. **edwardsi**, 139–140, 142
t. fuscus, 133, 140, 141–142, 143, 144
t. **ginetensis**, 137, 138, 139, 142, 144
t. lineolatus, 133, 136
t. **melodus**, 136, 137, 140, 142, 144
t. **moorei**, 138–139, 142, 144
t. paynteri, 133, 135, 139, 142, 144
t. **pettingilli**, 133–134, 135, 136, 140, 142, 143, 144
t. **rufescens**, 142–143, 144
t. salvadoranus, 133, 140, 141, 142
t. sharpei, 133, 134, 135, 142, 143, 144
t. subsp., 140–141, 142
t. taylori, 133, 140, 141, 142
t. thoracicus, 133, 134–135, 136, 137, 142, 144
Davis, L. Irby, Observations on Mexican birds, 364–367
Delichon urbica, 248
Dendrocolaptes certhia, 230
Dendrocolaptidae, 230
Dendrocygna arborea, 311
Dendroica audubonii, 169
caerulescens, 55, 311
castanea, 55
cerulea, 55
coronata, 55, 82, 275
discolor, 55
dominica, 55, 275
fusca, 55
kirtlandii, 341
magnolia, 51, 54, 275
palmarum, 40, 55, 338–351
p. hypochrysea, 338–339
p. palmarum, 338–339, 340, 349
pensylvanica, 55
petechia, 54, 82
pinus, 341
striata, 40, 51, 55
tigrina, 40, 54
virens, 55, 311
Dendronessa, 291
Dexter, Ralph W., Observations on three albino American Robins, 185–186
Diatropura progne, 233
Dichromanassa rufescens, 106
Dickcissel, 55, 72, 74
Dickerman, Robert W., Notes on the Red Crossbill in Minnesota, 367–368
Dicruridae, 234
Dicrurus sp., 234
Dipper, Brown, 224, 230
European, 230
Dixon, Keith L., review by, 119
Dives dives, 276
Dolichonyx oryzivorus, 51, 55, 233

Dove, Blue Ground, 274
Eastern Turtle, 330
Ground, 53, 80, 82, 87, 90, 106, 304
Mourning, 53, 59, 82, 85, 91–101, 183, 326, 330
Ruddy Ground, 274
Turtle, 325, 326
White-winged, 59, 362
Zenaida, 304
Dowitcher, 53, 58
Long-billed, 112
Drepanoplectes jacksoni, 233
Drongo, 234
Duck, Black, 31, 280
Canvasback, 15–17, 21, 27, 32, 52, 182
Goldeneye, 21, 31
Gadwall, 21, 52
Grey, 16
Mallard, 15, 17, 21, 31, 52, 181, 280, 292, 294–299, 363–364, 368–370
Mandarin, 291–300
Muscovy, 291–300
Pekin, 292, 294–299
Pintail, 15, 17, 21, 31, 32, 52
Pochard, European, 24, 25, 30
Common, 32
Redhead, 5–34, 52
Ring-necked, 17, 32, 52
Ruddy, 21, 31, 52
Scaup, Lesser, 21, 52
Scoter, 24
White-winged, 21
Shoveller, 21, 52, 280
Teal, Blue-winged, 21, 52, 279, 280
Cinnamon, 15
Green-winged, 52, 109
Tufted, 7, 16–18
West Indian Tree, 311
Widgeon, American, 15, 21, 52
Wood, 16, 32, 280, 291–300, 369
Ducks, 180
Perching, 291
Dumetella carolinensis, 54, 80, 82, 85, 207, 230, 309, 371
Dyer, William A., see Walkinshaw, Lawrence H. ———
Eagle, Golden, 106
Egret, American, 184, 185
Common, 52
Reddish, 106
Snowy, 52, 184
Elanoides forficatus, 52
Elanus leucurus, 274
El Salvador, 124
Emberiza, 228
cioides, 331–332
Emberizidae, 232
Emberizinae, 232
Embryology, 92–94
Empidonax, 54, 64
flaviventris, 54
fulvifrons, 365
mexicanus, 365
minimus, 54
traillii, 54, 317–320
virescens, 54, 365
Ereunetes mauri, 53
pusillus, 53
Erolia bairdi, 53
fuscicollis, 53
melanotos, 53
minutilla, 53
Erwin, R. J., and Richard D. Porter, photograph by, 178
Estrilda temporalis, 233, 247
Estrildidae, 233
Eudocimus albus, 41, 52
Euphagus cyanocephalus, 102–105, 276
Euplectes franciscana, 208, 234
hordeaceus, 234
taha, 234
Falco, 149
columbarius, 52, 106
peregrinus, 52
sparverius, 52, 149–154, 274, 278–279, 304
tinnunculus, 149, 153
Falcon, 58
Peregrine, 52
Falconiformes, 55
Finch, Bengalese, 233
House, 79
Purple, 84, 85
Fisher, Harvey I., Footedness in Domestic Pigeons, 170–177
Flicker, 80, 82, 85, 181, 196, 230
Florida, 78, 106, 157
Florida caerulea, 41, 52, 185
Flycatcher, Acadian, 54, 64, 365
Alder, 317–321

Beardless, 167
Buff-breasted, 365
Crested, 53, 64, 80, 82
Least, 54, 64
Loggerhead, 308
Ochre-bellied, 230
Olive-sided, 50, 54, 64
Pileated, 365
Scissor-tailed, 53, 64, 275
Traill's, 54
Yellow-bellied, 54
Food habits, 104, 112, 129, 263, 278, 305–306
Fowl, Domestic, 26, 230
Fringilla coelebs, 224, 233
montifringilla, 233
Fringillidae, 74, 233
Fringillinae, 233
Fulica americana, 52, 181, 182
Gallinule, Purple, 52, 58
Gallus gallus, 26, 230
Garrulax, albogularis, 231
caerulatus, 231
chinensis, 231
erythrocephalus, 231
leucolophus, 231
ruficollis, 231
sp., 218, 231
Garrulus glandarius, 206, 225, 234
lanceolatus, 210, 234
lidthi, 235
Geococcyx californianus, 362
Georgia, 157
Geothlypis rostrata, 183
r. coryi, 183
trichas, 55, 166, 311
Glasgow, Leslie L., and Robert Henson, Mourning Dove nestlings infested with larvae of Philornis, 183–184
Glaucidium brasilianum, 167
Gnatcatcher, Blue-gray, 54, 64
Godwit, Hudsonian, 53, 58, 112
Marbled, 53, 58
Goldfinch, American, 326
Common, 82, 85, 320–321
Goose, Blue, 21
Canada, 10, 181, 370
Egyptian, 370
Emden, 292, 294–299
Greylag, 10
Pink-footed, 10
Snow, 21
Spur-winged, 291
Toulouse, 292, 295, 296
White-fronted, 166, 169
Grackle, 103, 104
Boat-tailed, 167, 233
Bronzed, 85,
Common, 205, 214, 233, 242, 244
Great-tailed, 366
Indian, 234
Tinkling, 195, 233
Gracula religiosa, 234
Grallina cyanoleuca, 234, 243
Grallinidae, 234
Grassquit, 311
Grebe, Eared, 181
Least, 273
Pied-billed, 51, 52, 112
Greenfinch, 325, 326, 332
Grosbeak, Black-headed, 167, 232
Blue, 55, 74
Crimson-collared, 273
Evening, 233
Rose-breasted, 55, 72, 74, 75, 226, 229, 232
Grouse, Black, 230
Red, 370
Ruffed, 197, 230, 348
Growth, 7–10, 14–15, 31–32, 94–100
Grus canadensis, 106, 311
Guatemala, 124
Guiraca caerulea, 55
Gull, 187
Black-headed, 248
Bonaparte, 166
California, 164, 279
Herring, 53, 59, 248
Ring-billed, 182
Gymnorhina dorsalis, 234
Habia gutturalis, 233
Hagar, Donald C., Jr., Nesting populations of Red-tailed Hawks and Horned Owls in central New York State, 263–272
Hall, Fred T., Proceedings of the thirty-eighth annual meeting, 281–288
Hamilton, William J., III, Blue-winged Teal nest parasitized by Brown-headed Cowbird, 279

Hanson, Harold C., and Charles W. Kossack, Methods and criteria for aging incubated eggs and nestlings of the Mourning Dove, 91–101
Harrell, Byron E., see Warner, Dwain W.
Hauser, Doris C., Some observations on sun-bathing in birds, 78–90
Hawfinch, 233
Hawk, Broad-winged, 41, 49, 52, 55, 263, 304
Cooper's, 52, 58, 110–111, 184, 263
Ferruginous Rough-legged, 279
Marsh, 52, 58, 111, 274
Pigeon, 52, 106
Red-shouldered, 263
Red-tailed, 169, 180–181, 263–272, 274
Rough-legged, 274
Sharp-shinned, 52, 184
Sparrow, 52, 274, 278–279, 304, 311
Swainson's, 166, 274
Hawk-eagle, Black and White, 273
Ornate, 274
Helmitheros vermivorus, 54
Henson, Robert, see Glasgow, Leslie L.
Heron, Black-crowned Night, 52, 166, 184, 185, 329
Great Blue, 52
Great White, 106
Green, 48, 51, 52, 82, 184, 185
Little Blue, 41, 52, 185
Louisiana, 52, 184–185
Yellow-crowned Night, 40, 51, 52, 185
Hesperiphona vespertina, 233
Heterophasia capistrata, 232
Himantopus mexicanus, 53
Hirundinidae, 64
Hirundo, 165
neoxena, 248
rustica, 54, 107, 109, 330
Honduras, 124
Honey-creeper, Blue, 311
Honeyeater, Yellow-eared, 232
Hummingbird, Bee, 306–307
Buff-bellied, 275
Cuban Emerald, 306
Ruby-throated, 53, 59, 155–163
Rufous-tailed, 275
Sabre-wing, Wedge-tailed, 275
Hybrid, Canvasback × Redhead, 27, 32
Redhead × Ring-necked, 32
Kakatoe sanguinea × roseicapilla, 230
Pheucticus melanocephalus × P. ludovicianus, 232
Hydranassa tricolor, 52, 184–185
Hylocichla, 362 (see Catharus)
fuscescens, 40, 51, 54
guttata, 54
minima, 54
mustelina, 41, 54, 231, 239
ustulata, 40, 54, 275
Ibis, White, 41, 49, 51, 52
Icteria virens, 55
Icteridae, 73, 233, 234
Icterus auratus, 366
fuertesi, 276, 367
galbula, 55, 208, 228, 233
gularis, 233, 276
jamacaii, 233
parisorum, 166
pustulatus, 216, 233
spurius, 55, 200–251, 276, 366–367
sp., 233
Ictinia misisippiensis, 52
Illinois, 333
Iowa, 333
Irenidae, 230
Iridoprocne, 165
bicolor, 54
Ixobrychus exilis, 50, 52, 362
Ixoreus naevius, 114
Jacana spinosa, 362
Jackdaw, 247, 248
Jay, Beechey's, 210, 235, 365
Blue, 80, 82, 83, 84, 85, 86, 87, 202, 210, 211, 217, 227, 235, 247
European, 206, 212, 216, 225, 228, 234, 242, 245, 247
Lanceolated, 210, 213, 234
Lidth, 235
Yucatan, 366
Jeter, Horace H., Eastern Phoebe nesting in Louisiana, 360–361
Johnston, Bette J., A technique for trapping cowbirds, 278
Johnston, David W., see Norris, Robert A.
Junco, Slate-colored, 84, 85, 232, 341

Junco, 353
hyemalis, 84, 85, 232, 341
Juhn, Mary, "Frightmolt" in a male Cardinal, 108–109
Jynx torquilla, 196, 230
Kakatoe sanguinea × roseicapilla, 230
Kansas, 108
Keefer, Mary Belle, Varied Thrush in Texas, 114
Kestrel, American, 149–154
Kilham, Lawrence, Egg-carrying by the Whip-poor-will, 113
Killdeer, 58, 109, 278–279
Kingbird, Eastern, 53, 59, 60, 326
Gray, 53, 61, 64, 308
Western, 53, 64
Kingfisher, Belted, 53, 59, 165
Kinglet, Golden-crowned, 232, 236
Ruby-crowned, 54, 64, 275, 362
Kite, Gray-headed, 274
Mississippi, 52, 55
Swallow-tailed, 52, 55
White-tailed, 274
Kitta chinensis, 235, 245
erythrorhyncha, 235, 245
Klimstra, W. D., and W. O. Stieglitz, Notes on reproductive activities of Robins in Iowa and Illinois, 333–337
Knot, American, 53
Kossack, Charles W., see Hanson, Harold C. ————
Lagopus scoticus, 370
Laniidae, 230
Lanius bucephalus, 200, 230, 331
ludovicianus, 200, 370
Lamprotornis caudatus, 234
chalybaeus, 234
Lanyon, Wesley E., review by, 374
Laridae, 59
Larus, 187
argentatus, 53, 248
californicus, 164, 279
delawarensis, 182
philadelphia, 166
ridibundus, 248
sp., 8
Laughing-Thrush, Black-throated, 231
Gray-sided, 231
Red-headed, 231
Rufous-necked, 231
White-crested, 231
White-throated, 231
Leavitt, B. B., Water moccasin preys on Pied-billed Grebe, 112–113
Leiothrix, Silver-eared, 231
Leiothrix argentauris, 231
lutea, 217, 229, 231
sp., 232
Leptodon cayanensis, 274
Leucophoyx thula, 52, 184
Limnodromus griseus, 53
scolopaceus, 53, 112
Limnothlypis swainsonii, 54
Limosa fedoa, 53
haemastica, 53, 112
Limpkin, 311
Linnet, 247, 248
Lophortyx gambelii, 197
Louisiana, 360
Loxia curvirostra, 367
c. benti, 367
c. minor, 367
c. sitkensis, 367
Lunk, William A., review by, 189–190
Lyrurus tetrix, 230
Mackenzie, 338
Magpie, 211, 213, 229, 235, 242
Australian, 234
Azure-winged, 235
Black-billed, 200
Blue, 325, 331
Green, 235, 245
Red-billed Blue, 235, 245
Magpie-Lark, 234, 243, 246
Magpie-Robin, 217, 231
Mammals
Capromys pilorides, 301
Didelphis marsupialis, 368
Felis domesticus, 243, 336
Herpestes, 304
Marmota monax, 263
Mephitis mephitis, 279
Microtus, 178
Procyon lotor, 266, 368
Sciurus carolinensis, 243, 266
Sylvilagus floridanus, 263
Manitoba, 5, 338, 349
Manville, Richard H., Effects of unusual spring weather on Scarlet Tanagers, 111–112

Mareca americana, 52
Marshall, Joe T., Jr., "Birds of Pine–oak woodland in southern Arizona and adjacent Mexico," reviewed, 374–375
Martin, Caribbean, 110
House, 248
Purple, 54, 61, 64
Mattison, Helmer, see Buss, Irven O.

McClure, H. Elliott, A study of summer bird populations near Tokyo, Japan, 323–332
Meadowlark, 326
Common, 233
Meanley, Brooke, see Neff, Johnson A.

Measurements, 6, 367–368
Megaceryle alcyon, 53, 165
Megadyptes antipodes, 13
Melanerpes erythrocephalus, 59
Melanitta deglandi, 21
spp., 24
Melanotis hypoleucos, 362
Meleagrididae, 230
Meleagris gallopavo, 195, 230
Meliphaga lewini, 232
Meliphagidae, 232
Mellisuga helenae, 306–307
Melopyrrha nigra, 311
Melospiza lincolnii, 55, 227
melodia, 210, 232
Mexico, 124, 273, 364
Meyerriecks, Andrew J., "Bunching" reaction of Cedar Waxwings to attacks by a Cooper's Hawk, 184; Louisiana Heron breeds in New York City, 184–185; Sparrow Hawks prey on newly hatched Killdeer, 278–279
Michigan, 13, 183, 317–322, 338, 339, 340–341, 344, 345, 349
Micropalama himantopus, 50, 53
Middle America, 145
Migration, 12–13, 39–75, 164–169, 263, 338–339, 352–359, 367
Miller, Alice D., Feeding behavior of Red-tailed Hawks, 180–181; A pallid-eyed individual of Dumetella carolinensis, 371
Miller, Loye, Some avian flyways of western America, 164–169
Mimidae, 64, 230, 361
Mimocichla plumbea, 308–309
p. rubripes, 308
Mimus gilvus, 361, 362
g. gracilis, 361
polyglottos, 81, 82, 85, 230, 246, 309, 361–363
saturninus, 361, 362
Minla cyanouroptera, 232
Minnesota, 339, 340, 345, 348, 367
Mniotilta varia, 54
Mockingbird, 81, 82, 85, 86, 230, 246
Blue, 362
Calandria, 361
Common, 361–363
Graceful, 361
Northern, 309–310
Molothrus ater, 103, 233, 278, 279, 319, 370
Molts and plumages, 15–34, 96–100, 123–124, 131–132, 157–158, 185, 306, 364, 368
Motacilla alba, 247
Motacillidae, 65, 230
Munia striata, 233
Muscivora forficata, 53, 275
Muscicapidae, 231
Muscicapinae, 232
Myadestes elisabeth, 311–312
unicolor, 223, 231
Myiarchus crinitus, 53, 80, 82
stolidus antillarum, 110
Mynah, Bank, 234
Chinese Jungle, 234
Indian, 208, 234, 245
Indian Jungle, 234
Neff, Johnson A., and Brooke Meanley, Status of Brewer's Blackbird on the Grand Prairie of Eastern Arkansas, 102–105
Neophema pulchella, 230
Nesting, 13, 92–100, 131, 183, 265–267, 270–271, 279, 280, 317–321, 333–336, 342–349, 268–370
New Hampshire, 113
New Jersey, 181
New York, 184
Nighthawk, 111
Booming, 365
Common, 50, 51, 53, 59, 60, 306
Spotted-tailed, 364
Nightjar, Antillean, 306
Niltava, Rufous-bellied, 232

Niltava sundara, 232
Norris, Robert A., Clyde E. Connell, and David W. Johnston, Notes on fall plumages, weights, and fat condition in the Ruby-throated Hummingbird, 155–163
North Carolina, 78
North Dakota, 352
Numenius americanus, 53
hudsonicus, 53
Nuttallornis borealis, 50, 54
Nyctanassa violacea, 40, 52, 185
Nycticorax, 166
nycticorax, 52, 184, 329
Odontophorinae, 145
Odontophorus lineolatus, 132, 137
Ohio, 280
Ontario, 338–339
Oporornis formosus, 55
philadelphia, 55
tolmiei, 166
Oriole, Alta Mira, 276
Baltimore, 55, 73, 208, 228, 233
Black-throated, 233, 276
Fuertes, 276, 367
Orange, 366
Orchard, 55, 71, 73, 200–251, 366
Scott's, 166
Streak-backed, 216, 233
Oriolus melanocephala, 237
Ortyx thoracicus, 132
Osprey, 40, 52, 58, 166
Ouzel, Ring, 231
Ovenbird, 55, 73, 85
Owl, Barn, 306
Barred, 263, 345
Ferruginous Pigmy, 167
Horned, 196, 230, 263–272, 369
Little, 248
Saw-whet, 178
Short-eared, 53, 110
Oxyura jamaicensis, 21, 31, 52
Pachycephala rufiventris, 208, 232
Pachycephalinae, 232
Pachyramphus major, 275
Packard, Robert L., Broad-winged Hawk in Coahuila, 370–371
Pandion haliaetus, 40, 52, 166
Paradisaeidae, 234
Paradoxornis, Black-throated, 232
Paradoxornis gularis, 232
Paradoxornithinae, 232
Parakeet, Turquoise, 230
Parkes, Kenneth C., Notes, chiefly distributional, on some Florida birds, 106–107
Parasitism, 183, 237
Paroaria capitata, 232
Parrot, Cuban, 304
Red-crowned, 274
Yellow-cheeked, 274
Unidentified, 230
Parula americana, 54
Parulidae, 65, 233
Parus bicolor, 80, 82, 85
Passer domesticus, 79, 82, 85, 180, 198, 233, 276, 278, 326
montanus, 326, 327, 331
Passerculus sandwichensis, 55
Passerella iliaca, 90, 232
Passerherbulus caudacutus, 341
Passerina amoena, 232
ciris, 51, 55, 200, 311
cyanea, 55, 207, 232
leclancherii, 233
Pelecaniformes, 51
Pelecanus erythrorhynchos, 41, 52, 166
Pelican, White, 41, 51, 52, 166, 167, 168
Penguin, Yellow-eyed, 13
Pepper-shrike, Rufous-browed, 275
Perdix lineolata, 132
Peters, Stuart S., Brood capture involving conflict between two female Mallards, 363–364
Petrochelidon, 165
fulva, 308
pyrrhonota, 51, 54
Pewee, Eastern Wood, 54, 64, 82
Greater Antillean, 308
Phainopepla nitens, 166
Phalarope, Wilson's, 53, 59
Phalaropodidae, 58
Phasianidae, 196, 230
Phasianus colchicus, 13, 230, 369
Pheasant, Bamboo, 325, 326
Ring-necked, 13, 117, 197, 230, 369
Pheucticus ludovicianus, 55, 226, 232
melanocephalus, 167, 232
melanocephalus × ludovicianus, 232
Philortyx, 145
Phoebe, Eastern, 53, 64, 360
Say's, 365

Phoenicoparrus jamesi, 189–190
Phoenicopterus ruber, 189–190
Physiology, 89–90, 149–154, 159–162, 291
Pica pica, 213, 229, 235
  p. hudsonia, 200
Picidae, 59, 230, 236
Picus viridis, 196, 230
Pierce, Robert A., review by, 117–119
Pigeon, Domestic, 170–177
  Plain, 304
  Red-necked, 304
  White-crowned, 304
Pipilo erythrophthalmus, 79, 82, 232, 278
  fuscus, 232
Pipit, American, 54, 65
  Meadow, 247, 248
  Tree, 230, 248
Pipromorpha oleaginea, 230
Piranga erythromelas, 111
  olivacea, 55, 214, 233
  rubra, 55, 82, 87, 233, 279
Pitangus sulphuratus, 276
Plectropterinae, 291
Plectropterus gambiensis, 291
Ploceidae, 233
Ploceus rubiginosus, 233
Plover, Black-bellied, 53, 58, 109
  Golden, 53, 58
  Piping, 58
  Semipalmated, 52, 58
  Snowy, 58, 106
  Upland, 53, 56, 58
  Wilson's, 52, 58
Pluvialis dominica, 53
Podiceps caspicus californicus, 181
  dominicus, 273
Podilymbus podiceps, 52, 112
Polioptila caerulea, 54
Pomatorhinus erythrogenys, 231
  schisticeps, 231
Population biology, 129–130, 263–272, 317–321, 323–332
Porphyrula martinica, 52
Porter, Richard D., see Erwin, R. J. ———
Porzana carolina, 52, 109
Predation, 112, 184, 263, 278, 279, 368–370
Preston, F. W., The look-out perch as a factor in predation by Crows, 368–370
Priotelus temnurus, 307–308
Progne subis, 54
  s. dominicensis, 110
Protonotaria citrea, 54
Psittacidae, 230, 236
Ptilonorhynchus violaceus, 234
Quail, Bob-white, 91, 197, 304, 326
  Gambel's, 197
  Mearns', 123
  Montezuma, 123
  Scaled, 196, 197, 230, 280
  Singing, 123–148
Quiscalus, 103
  niger, 195, 233
  quiscula, 205, 233, 244
  q. aeneus, 233
  q. stonei, 233
  versicolor, 85, 233
Rail, Black, 58
  Sora, 52, 56, 58, 109
  Virginia, 58
Rallidae, 58
Rand, A. L., Sanderlings eat fishermen's bait minnows, 186–187
Raven, 235
Recurvirostra americana, 112
Recurvirostridae, 58
Redstart, American, 51, 55, 73, 75, 82, 311
Redwing, 182, 207, 231
Regulus calendula, 54, 275, 362
  satrapa, 232, 236
Reptiles
  Agkistrodon piscivorus, 112
  Lampropeltis getulus nigra, 279
  Sceloperus olivaceus, 363
Rhodothraupis celaeno, 273
Richmonedna cardinalis, 79, 82, 85, 109 (see Cardinalis)
Riparia riparia, 54, 110
Ripley, S. Dillon, photograph by, opp. 291
Roadrunner, 362
Robin, American, 54, 64, 82, 85, 185–186, 207, 213, 214, 226, 231, 239, 241, 242, 308, 333–337
  Clay-colored, 231
  Peking, 217, 229, 231
Rook, 206, 216, 235, 242, 246, 247, 248
Saltator, Buff-throated, 232
  Grayish, 277
Saltator coerulescens, 276, 277
  maximus, 232
Sanderling, 53, 58, 186–187

Sandpiper, Baird's, 53
Buff-breasted, 53, 58
Least, 53
Pectoral, 53, 56, 58
Semipalmated, 53, 58
Solitary, 53, 58
Spotted, 53, 58
Stilt, 50, 53, 58
Western, 53
White-rumped, 53, 58
Sapsucker, Yellow-bellied, 53, 59, 275
Saskatchewan, 338–339, 348
Saurothera merlini, 304
Sayornis phoebe, 53, 360
saya, 365
Schorger, A. W., The contributions of Josselyn Van Tyne to the Wilson Ornithological Society, 314–316
Scimitar-Babbler, Rusty-cheeked, 231
Yellow-billed, 231
Scolopacidae, 58
Seaman, G. A., New bird records for Barbuda, British West Indies, 109–110; Status of the Stolid Flycatcher in the American Virgin Islands, 110
Seedeater, Black, 210, 232
Seiurus aurocapillus, 55, 85
motacilla, 55
noveboracensis, 55
Setophaga picta, 362
ruticilla, 51, 55, 82, 311, 362
Shrike, Bull-headed, 200, 230, 325, 326
Loggerhead, 200, 370
Shrike-Thrush, Little, 232
Sialia sialis, 248, 370
Sibia, Black-headed, 232
Sick, Helmut, Anting by two tanagers in Brazil, 187–188
Siva, Blue-winged, 232
Skylark, 325, 326, 330
Snipe, Wilson's, 53, 58
Solitaire, 311
Slate-colored, 223, 231
Sora, 52, 56, 58, 109
South Carolina, 155
South Dakota, 352
Sparrow, Chipping, 85, 169, 341
English, 278, 326
Field, 326
Fox, 90, 232
Grasshopper, 55, 74
Harris', 232, 352–358
House, 79, 80, 81, 82, 84, 85, 180, 198, 200, 233, 276, 277, 311
Lark, 179–180
LeConte's, 341
Lincoln's, 55, 74, 277
Savannah, 55, 74
Song, 210, 212, 232
Tree, 326, 327
White-crowned, 232
White-throated, 82, 84, 85, 86, 88, 232, 352, 355
Spatula clypeata, 21, 52, 280
Sperry, Charles C., Golden Eagle attacks decoy duck, 106–107
Sphyrapicus varius, 53, 275
Spindalis zena, 310–311
Spinus tristis, 82, 85, 320–321
Spiza americana, 55
Spizaetus ornatus, 274
Spizaster melanoleucus, 273, 274
Spizella passerina, 85, 169, 341
Sporophila aurita, 210, 232
Spreo superbus, 234
Squatarola squatarola, 53, 109
Starling, 13, 82, 83, 85, 104
Ashy, 325, 326, 327
Common, 198, 206, 207, 211, 217, 225, 234, 237, 248, 326
European, 184
Glossy, 234
Long-tailed Glossy, 234
Pied, 234
Rose-coloured, 234
Superb, 234
Steganopus tricolor, 53
Stelgidopteryx ruficollis, 54
Stephens, T. C., "An Annotated Bibliography of North Dakota Ornithology," reviewed, 120
Sterna albifrons, 50, 53
anaethetus, 182
f. fuscata, 181
Stevens, O. A., Fall migration and weather, with special reference to Harris' Sparrow, 352–359; review by, 120
Stevenson, Henry M., The relative magnitude of the trans-gulf and circum-gulf spring migrations, 39–77

Stewart, Paul A., Nesting of the Shoveller (Spatula clypeata) in central Ohio, 280
Stieglitz, W. O., see Klimstra, W. D. ———
Stilt, Black-necked, 53, 58
Stophlet, John J. Nocturnal predation on Summer Tanager, nestling by kingsnake, 279
Streptopelia orientalis, 330
Strigidae, 230
Strix varia, 263, 345
Struthidea cinerea, 234
Sturnella magna, 233
Sturnidae, 234
Sturnus cineraceus, 327, 331
  contra, 234
  roseus, 234
  vulgaris, 13, 82, 83, 85, 104, 184, 198, 234, 237
Sugarbird, Blue, 217, 233, 245
Sutton, George Miksch, painting by, opp. 123
Swallow, Antillean Cliff, 308
  Bank, 54, 64, 75, 110
  Barn, 54, 64, 107, 109, 165, 166, 326
  Cliff, 51, 54, 64, 75, 165
  House, 325
  Rough-winged, 54, 64
  Tree, 54, 64, 165, 166
  Violet-green, 165, 166
  Welcome, 248
Swift, 248
  Chimney, 40, 53, 59
  Vaux, 165
Sylviidae, 64
Sylviinae, 232
Tachycineta, 165
Tamaulipas, 273
Tanager, Blue-necked, 233, 245
  Blue-breasted, 233
  Scarlet, 55, 71, 74, 75, 111–112, 214, 233
  Stripe-headed, 311
  Summer, 55, 74, 82, 87, 90, 233, 279
  Superb, 233
  Yellow-winged, 276
Tanagrinae, 233
Tangara cyanicollis melanogaster, 187–188
  cyanoventris, 187–188
Tangavius aeneus, 276
Taxonomy, 132–143, 291, 308
Telmatodytes palustris, 108
  p. dissaeptus, 108
  p. plesius, 108
Teretistris fernandinae, 310
Tern, Black, 53, 59
  Bridled, 182
  Cabot's, 53
  Forster's, 59
  Least, 50, 53, 59
  Royal, 82
  Sooty, 181
Tetrao urogallus, 230
Texas, 114, 119, 363
Thalasseus maximus, 82
  sandvicensis, 53
Thomas, Jack W., Anting performed by Scaled Quail, 280
Thrasher, Brown, 78, 81, 82, 83, 85, 361, 363
Thraupidae, 74
Thraupis abbas, 276
Thrush, Gray-cheeked, 54, 63, 64, 75, 231
  Hermit, 54, 64, 231
  Mistle, 228, 231, 243
  Olive-backed, 40, 54, 62, 64, 75, 231, 275
  Shama, 217, 231
  Song, 207, 211, 231
  Varied, 114
  Western Red-legged, 308–309
  Wood, 41, 54, 62, 64, 231, 239
Thryothorus ludovicianus, 81, 82, 85
Tiaris canora, 311
  olivacea, 311
Timaliinae, 231
Titmouse, Tufted, 80, 82, 85
Todus multicolor, 308
Tody, Cuban, 308
Totanus flavipes, 53 (see Tringa)
  melanoleucus, 53
Towhee, Brown, 232
  Red-eyed, 232, 278
  White-eyed, 79, 82
Toxostoma rufum, 78, 82, 85, 361
Tree-pie, 235
Tringa flavipes, 112
  solitaria, 53
Troglodytes aedon, 54
Troglodytidae, 64
Trogon, Coppery-tailed, 273
  Cuban, 307–308
Trogon elegans, 273

Troupial, 233
Tryngites subruficollis, 53
Turdidae, 64
Turdinae, 231
Turdus, 308
  ericetorum, 231
  grayi, 231, 276
  merula, 207, 231
  migratorius, 54, 82, 85, 185–186, 207, 231, 241, 242, 308, 333–337
  musicus, 207, 213, 231, 241
  philomelos, 207, 213, 231, 241
  torquatus, 231
  viscivorus, 228, 231
Turkey, Wild, 195, 196, 230
Turnstone, Ruddy, 53, 58
Tyrannidae, 59, 230
Tyrannus caudifasciatus, 308
  dominicensis, 53, 308
  tyrannus, 53
  verticalis, 53
Tyto alba, 306
Utah, 13
Vaurie, Charles, Field notes on some Cuban birds, 301–313
Veery, 40, 51, 54, 63, 64, 75, 231
Vermivora bachmanii, 54
  celata, 54, 82, 85
  chrysoptera, 54
  peregrina, 54
  pinus, 54, 226, 233
  ruficapilla, 54, 107
Vireo, Bell's, 54, 65
  Black-whiskered, 310
  Blue-headed, 54, 65
  Cuban, 310
  Golden, 366
  Hutton's, 366
  Mangrove, 366
  Peten, 366
  Philadelphia, 54, 65
  Red-eyed, 51, 54, 65, 66, 82
  Thick-billed, 310
  Warbling, 54, 65
  White-eyed, 54, 65, 366
  Yellow-throated, 54, 65
Vireo altiloquus, 310
  bellii, 54
  crassirostris, 310
  flavifrons, 54
  gilvus, 54
  griseus, 54, 366
  gundlachii, 310
  huttoni, 366
  hypochryseus, 366
  ochraceus, 366
  olivaceus, 51, 54, 82
  o. flavoviridis, 273
  pallens, 366
  philadelphicus, 54
  semiflavus, 366
  solitarius, 54
Vireonidae, 65
Virgin Islands, 110
Voice, 130, 307, 364–367
Vulture, Turkey, 52, 55, 304
Wagtail, Pied, 247, 248
Walkinshaw, Lawrence H., William A. Dyer, W. Powell Cottrille, and Betty Darling Cottrille, Yellow-headed Blackbird nesting in Michigan, 183
Walkinshaw, Lawrence H., and Mark A. Wolf, Distribution of the Palm Warbler and its status in Michigan, 338–351
Warbler, Audubon, 169
  Bachman's, 54, 65
  Bay-breasted, 55, 68, 73, 75
  Black-and-white, 54, 65
  Blackburnian, 55, 73, 75
  Black-poll, 40, 51, 55, 69, 73
  Black-throated Blue, 55, 73, 311
  Black-throated Green, 55, 73, 75, 311
  Blue-winged, 54, 65, 75, 226, 233
  Canada, 55, 73
  Cape May, 40, 54, 65, 73
  Cerulean, 55, 67, 73, 75
  Chestnut-sided, 55, 68, 73, 75
  Connecticut, 73
  Golden-winged, 54, 65, 75
  Hooded, 55, 70, 73, 75
  Kentucky, 55, 69, 73
  Kirtland's, 73, 340
  Magnolia, 51, 54, 65, 75, 275
  Mourning, 55, 73
  Myrtle, 55, 73, 82, 84, 85, 87, 88, 275
  Nashville, 54, 65, 107
  Orange-crowned, 54, 65, 82, 85, 87
  Palm, 40, 55, 73, 338–351
  Parula, 54, 65
  Pine, 341

Prairie, 55
Prothonotary, 54, 65, 66
Reed, 89
Swainson's, 54, 65
Tennessee, 54, 65, 67, 75
Tolmie, 166
Wilson's, 55, 73
Worm-eating, 54, 65
Yellow, 54, 65, 75, 82
Yellow-headed, 310
Yellow-throated, 55, 73, 275
Warner, Dwain W., and Byron E. Harrell, The systematics and biology of the Singing Quail, Dactylortyx thoracicus, 123–148
Water-thrush, Louisiana, 55, 73
Northern, 55, 73, 75
Waxbill, Red-browed, 233, 247, 248
Waxwing, Cedar, 54, 65, 184, 230, 248
Weaver, Chestnut, 233
Weights, 10–14, 159–162, 181–182
Weller, Milton W., Growth, weights, and plumages of the redhead, Aythya americana, 5–35; painting by, opp. 5
West Indies, 109
Whip-poor-will, 59, 113, 365
Wisconsin, 111
Whistler, Rufous, 208, 210, 232
Whitaker, Lovie M., Lark Sparrow oiling its tarsi, 179–180; A résumé of anting with particular reference to a captive orchard oriole, 195–262; Comments on wing-flashing and its occurrence in Mimidae with uniformly colored wings, 361–363
White-eye, Western, 217, 232
Whydah, 233
Widow-Bird, Jackson's, 233
Long-tailed, 233
Yellow-shouldered, 233
Willet, 53
Wilson Ornithological Society
Committees, 116, 373
Editorial notes, 115, 372
Ornithological literature, 117–120, 189–191, 373–374
Proceedings of the thirty-eighth annual meeting, 281–288
Research grant, 115, 372
Wilsonia canadensis, 55
citrina, 55
pusilla, 55
Wisconsin, 333, 340, 345
Wolf, Mark A., see Walkinshaw, Lawrence H.
Wolfe, L. R., "Check-list of the Birds of Texas," reviewed, 119–120
Woodhewer, Barred, 230
Woodpecker, Cuban Green, 308
Golden-fronted, 80, 82, 196, 230
Green, 196, 230
Lewis, 166, 167
Red-bellied, 80, 82, 83, 85, 87
Red-headed, 59
West Indian Red-bellied, 308
Woolfenden, Glen E., Telmatodytes palustris plesius wintering in southwestern Kansas, 108; Specimens of three birds uncommon in New Jersey, 181–182
Wren, Carolina, 81, 82, 85
House, 54, 64
Long-billed Marsh, 108
Wryneck, 196, 230
Xanthocephalus xanthocephalus, 183
Xiphidopicus percussus, 308
Yellow-legs, Greater, 53
Lesser, 53, 112
Yellow-throat, 55, 73, 166, 311
Bahaman, 183
Yuhina nigrimentum, 232
Zenaida asiatica, 362
aurita, 304
Zenaidura macroura, 53, 82, 85, 91–101, 183
Zimmerman, Dale A., Notes on Tamaulipan birds, 273–277
Zonotrichia albicollis, 82, 84, 85, 232, 352
leucophrys, 232
querula, 232, 352
Zosteropidae, 232
Zosterops palpebrosa, 217, 232

This issue of *The Wilson Bulletin* was published on January 7, 1958.

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